Roboy Dialog Manager

Release 2.1.9

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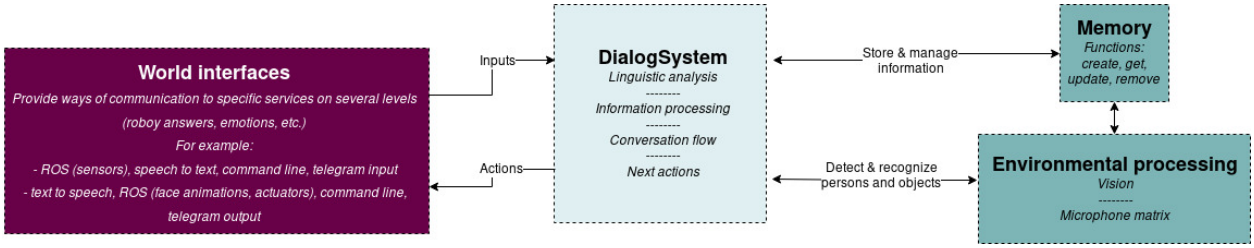
Usage and Installation

The Roboy Dialog (or Dialog Manager) System (RDS) is a sophisticated software module representing the cognitive capabilities of the humanoid anthropomimetic robot Roboy. The goal of the project is to implement dialog routines and knowledge extraction for a realistic human-like conversation flow which is achieved by utilizing various behaviour models represented by the State Machine (RDSM) finite automaton defined via a certain Roboy Personality description (file). Within the particular conversation flow stages, the behavioural variability is obtained by extending and redefining the common RDSM State to produce a certain social interaction. The RDMS State both as actor and as reactor regarding the internally formulated output and externally acquired input. For example, the voice input is processed via the Listening Device -> Speech-to-Text -> Analyzers & Semantic Parser -> Linguistics package -> (InferenceEngine) -> State sequence. It also allows being deployed on a multitude of communication channels for a broader interaction audience.

The overview diagram shows the external systems which Dialog System interacts with, and the tasks for which the system is responsible.



CHAPTER 1

Status

Stable functionality:

- Roboy introduces himself
- Roboy answers questions about himself
- Roboy answers questions about facts
- Roboy recognizes once someone saying one's name
- Roboy asks questions about people he meets
- Roboy stores and retrieves the information about people he meets
- Roboy stores and retrieves the information about himself

In development:

- Roboy updates the information (name, occupation, ect.) about people he meets
- Roboy updates the information about himself
- Roboy recognizes the intent behind an asked questions (age, creator, capabilities etc.)
- The Roboy Dialog is fully deployable on multiple internet channels.

CHAPTER 2

Relevant Background Information and Pre-Requisites

A User should be familiar with:

- Roboy Personality Files
- Roboy Context
- Roboy Memory Module
- Roboy Semantic Parser Module
- ROS

A Developer should be familiar with:

- Roboy Personality Files
- Roboy Context
- Roboy Memory Module
- Roboy Communication Protocol
- Roboy Semantic Parser Module
- Java programming language
- Maven automation tool
- ROS
- rosjava
- Sockets

Reading list for a User:

- rosjava Documentation

Reading list for a Developer:

- Java Documentation
- Maven Documentation

- rosjava Documentation
- Roboy Memory Module Documentation

CHAPTER 3

Contents:

3.1 Installation

We use Apache Maven build automation tool.

3.1.1 Using command line

Install Maven on the computer. `sudo apt install maven`

Make sure that you are using Java 1.8 both for 'java' and 'javac'! You can check this by running:

'' > javac -version

> java -version ''

Clone the Dialog Manager repository. `git clone --recursive https://github.com/Roboy/roboy_dialog`

Navigate to the root module. `cd roboy_dialog`

Download roboy parser. `git submodule update --init ./roboy_parser`

Install roboy parser as described in the roboy_parser docs or the 'semantic parser' page in 'INTERFACES AND SCOPE'.

Compile the project - Maven will take care of the rest. `mvn clean install`

Execute the project. `./start.sh`

3.1.2 Using IDE (Eclipse, Intellij IDEA)

Clone the Dialog Manager repository. `git clone https://github.com/Roboy/roboy_dialog`

Now, import Dialog System as a Maven project into the IDE of your choice. Build and execute using `roboy.dialog.ConversationManager` as the main class.

3.2 Getting started

3.2.1 How does it work?

The basic NLP architecture is designed as a pipeline.

1. An input device (derived from `de.roboy.io.InputDevice`) is producing text.
2. The text is is passed to a variety of linguistic analyzers (derived from `de.roboy.linguistics.sentenceanalysis.Analyzer`). This currently consists of a Tokenizer and a POS tagger (both in `de.roboy.linguistics.sentenceanalysis.SentenceAnalyzer`) but could in the future be accompanied by named entity recognition, a syntactical and semantical analysis, an interpretation of the sentence type or other tools.
3. The results of all these linguistics analyzers are collected together with the original text and stored in an Interpretation instance. (`de.roboy.linguistics.sentenceanalysis.Interpretation`)
4. The interpretation ispassed on to a state machine (states are derived from `de.roboy.dialog.personality.states.State`) within a personality class (derived from `de.roboy.dialog.personality.Personality`) that decides how to react to the utterance. In the future, the intentions (`de.roboy.logic.Intention`) determined by the state machine will then formulated into proper sentences or other actions (`de.roboy.dialog.action.Action`) by a module called Verbalizer. Currently, these actions are still directly created in the personality class.
5. Finally, the created actions are sent to the corresponding output device (`de.roboy.io.OutputDevice`).

3.2.2 Design choices

There are interfaces for each step in the processing pipeline to enable an easy exchange of elements. The goal would be to easily exchange personalities based on the occasion.

The implementation of the pipeline is in Java. Integrations with tools in other languages, like C++ RealSense stuff, should be wrapped in a module in the pipeline.

3.2.3 How to extend it?

Pick the corresponding interface, depending on which part of the system you want to extend. If you want to add new devices go for the input or output device interfaces. If you want to extend the linguistic analysis implement the Analyzer interface or extend the SentenceAnalyzer class. If you are happy with input, linguistics and output and just want to create more dialog, implement the Personality interface.

Create a new . . .	By implementing . . .
Input Device	de.roboy.io.InputDevice
NLP Analyzer	de.roboy.linguistics.sentenceanalysis.Analyzer
State Machine	de.roboy.dialog.personality.Personality
State	de.roboy.dialog.personality.states.State
Action type	de.roboy.dialog.action.Action
Output device	de.roboy.io.OutputDevice

The interfaces are deliberately simple, containing only 0 - 2 methods that have to be implemented. Once you implemented your new classes include them in the personality used in `de.roboy.dialog.DialogSystem`, if you only implemented single states or directly in `de.roboy.dialog.DialogSystem` for everything else.

3.3 Tutorials

3.3.1 Adding a New State

Roboy often visits different events and you might want him to say something specific, for example mention a company or a sponsor. One way to do this would be to modify an existing state. However, these changes are often discarded as you still want to have the old behaviour. There is a better way: create a new custom state specifically for your needs.

In this tutorial you will learn how to design and implement a new state. To keep everything simple, the state will just ask a yes-no question and listen to the answer. Based on the answer, you will pick one of two replies and choose one of two transitions.

Do you know math?

Let's start! We are going to add a state that tests whether the interlocutor (person speaking to Roboy) knows some basic math. First, create a new class named `DoYouKnowMathState` that extends from `roboy.dialog.states.definitions.State`:

```
// inside DoYouKnowMathState.java

public class DoYouKnowMathState extends State {

}
```

Your IDE will notify you that three functions (`act()`, `react(...)` and `getNextState()`) have to be implemented. Let's add them:

```
// inside DoYouKnowMathState.java

@Override
public Output act() {
    return null;
}

@Override
public Output react(Interpretation input) {
    return null;
}

@Override
public State getNextState() {
    return null;
}
```

Additionally, we need a special constructor and a new variable to store the next state for later:

```
// inside DoYouKnowMathState.java

private State next;

public DoYouKnowMathState(String stateIdentifier, StateParameters params) {
    super(stateIdentifier, params);
}
```

Now, we can write some logic and define what our new state should do. The `act()` function is always executed first. In our case, we want to ask a simple question. Replace `return null;` inside `act()` with following:

```
// inside public Output act()

return Output.say("What is 2 plus 2?");
```

The interlocutor's answer will be passed to the `react(...)` function once it is available. Inside, we should check whether the answer is correct and react based on correctness. This code is one of the simplest ways to do this:

```
// inside public Output react(Interpretation input)

// get tokens (= single words of the input)
String[] tokens = (String[]) input.getFeatures().get(Linguistics.TOKENS);

// check if the answer is correct (simplest version)
if (tokens.length > 0 && tokens[0].equals("four")) {
    // answer correct
    next = getTransition("personKnowsMath");
    return Output.say("You are good at math!");
} else {
    // answer incorrect
    next = getTransition("personDoesNotKnowMath");
    return Output.say("Well, 2 plus 2 is 4!");
}
```

Note a few things here:

- to keep this tutorial simple, we only check whether the first word of the reply equals "four"
- based on reply correctness, we get the next state using `getTransition(<transitionName>)` save it for later
- similarly to `act()`, we define the output with `return Output.say(<stringToSay>);`

Finally, we can implement the last required function `getNextState()` that defines the next state to enter. Inside, we just return the next state that we defined inside `react(...)`:

```
// inside public State getNextState()

return next;
```

That's it, you have just created your first state! Here is how the class should look like:

```
// inside DoYouKnowMathState.java

package roboy.dialog.tutorials.tutorialStates;

import roboy.dialog.states.definitions.State;
import roboy.dialog.states.definitions.StateParameters;
import roboy.linguistics.Linguistics;
import roboy.linguistics.sentenceanalysis.Interpretation;

public class DoYouKnowMathState extends State {

    private State next;

    public DoYouKnowMathState(String stateIdentifier, StateParameters params) {
        super(stateIdentifier, params);
    }
```

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```
    @Override
    public Output act() {
        return Output.say("What is 2 plus 2?");
    }

    @Override
    public Output react(Interpretation input) {

        // get tokens (= single words of the input)
        String[] tokens = (String[]) input.getFeatures().get(Linguistics.TOKENS);

        // check if the answer is correct (simplest version)
        if (tokens.length > 0 && tokens[0].equals("four")) {
            // answer correct
            next = getTransition("personKnowsMath");
            return Output.say("You are good at math!");

        } else {
            // answer incorrect
            next = getTransition("personDoesNotKnowMath");
            return Output.say("Well, 2 plus 2 is 4!");
        }
    }

    @Override
    public State getNextState() {
        return next;
    }
}
```

The newest version of the complete code can be found in in `roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState`. Read the tut_new_personality tutorial to learn how to connect your new state with others.

Example output

When using the new state, you could encounter the conversation:

```
[Roboy]: What is 2 plus 2?
[You]:   four
[Roboy]: You are good at math!
```

Or, if you provide a wrong answer:

```
[Roboy]: What is 2 plus 2?
[You]:   one
[Roboy]: Well, 2 plus 2 is 4!
```

To learn more details about states and personalities, refer to the *Personality and states* page. There, you will find details about state fallbacks, parameters and interfaces, as well as more information about different personalities and more output options.

3.3.2 Creating a New Personality

Roboy's Dialog System can be used in different environments and situations like fairs, conferences, demos or as a chatbot on social networks. For every given situation, Roboy's behaviour should be different. We use personalities to

define Roboy's way of talking.

In this tutorial you will learn how to create a new personality. Make sure that you know the basic functionality of states. If you are not familiar with them, read the *Adding a New State* tutorial. General information about personalities can be found on the *Personality and states* page.

Personalities are defined inside JSON personality files. Each file represents a state machine and defines:

- initial state: state in which Roboy starts the conversation
- transitions: connections between the states and the dialog flow
- fallbacks: backup if a state fails to react to unexpected input

State definition

Every state inside the personality file is defined by a JSON object. Here is an example:

```
{
  "identifier": "MathTest",
  "implementation" : "roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState",
  "transitions" : {
    "personKnowsMath" : "Farewell",
    "personDoesNotKnowMath" : "Farewell"
  },
  "comment": "A state that will test your math knowledge."
}
```

We have just defined a state that is called `MathTest`. Every state must have a unique identifier.

The `implementation` property defines which Java class should be used for this state when the Dialog System is running. When the Dialog System loads a personality file, it creates a Java object of the right class for *every* state defined in the file.

It is important to provide the complete class name (including the package) so that the Dialog System can find the right class and instantiate an object of it when loading the file. Special care is needed when doing refactoring. Make sure to change the personality file when you rename a state or move it to a different package!

Next, we have `transitions`. Here we define the connections between states. You should define all transitions that could be taken by the state implementation. For the `DoYouKnowMathState` we have two of them: `personKnowsMath` and `personDoesNotKnowMath` (look for `getTransition(<transitionName>)` inside the Java code). In the JSON file, the key is the transition name (e.g. `personKnowsMath`) and the value (here `Farewell`) is the identifier of another state in the *same* personality file (do not confuse with Java class names). We will take a look at the definition of the `Farewell` state a bit later.

The `comment` property is optional and will be ignored completely by the Dialog System. It just gives you an option to note some details about the state. There are two additional properties that you can (and sometimes have to) define: `parameters` and `fallback`. We will discuss them later as well.

Now, let's define the `Farewell` state. We will use one of the pre-implemented toy states. The definition looks like this:

```
{
  "identifier": "Farewell",
  "implementation" : "roboy.dialog.tutorials.tutorialStates.ToyFarewellState",
  "transitions" : {},
  "comment": "Last state: Tells goodbye, ignores reply, ends the conversation."
}
```

Nothing new here, except that we have no outgoing transitions for this state. This is because the `ToyFarewellState` always ends the conversation and will never take any transition.

Complete personality file

With two states defined, we can now take a look at the complete personality file. All state definitions are stored in the `states` array. Additionally, we define the `initialState` and pass the identifier `MathTest` of our `DoYouKnowMathState`. The complete file looks like this:

```
{
  "comment": "A simple personality that only contains two states (used in tutorial).",
  "initialState": "MathTest",
  "states": [
    {
      "identifier": "MathTest",
      "implementation" : "roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState",
      "transitions" : {
        "personKnowsMath" : "Farewell",
        "personDoesNotKnowMath" : "Farewell"
      },
      "comment": "A state that will test your math knowledge."
    },
    {
      "identifier": "Farewell",
      "implementation" : "roboy.dialog.tutorials.tutorialStates.ToyFarewellState",
      "transitions" : {},
      "comment": "Last state: Tells goodbye, ignores reply, ends the conversation."
    }
  ]
}
```

This file is stored under `resources/personalityFiles/tutorial/MathTest.json`. You can try running this personality by setting the path (`PERSONALITY_FILE`) in the config file (`config.properties`).

When you create a new personality file you might forget to define important transitions. To find errors faster, you can define the state interface (required transitions, parameters and fallback) for every state when you implement it. While loading the personality file, the Dialog System will check whether the state has everything it needs and warn you if something is missing. Read more about state interfaces on the *Personality and states* page.

Fallbacks and parameters

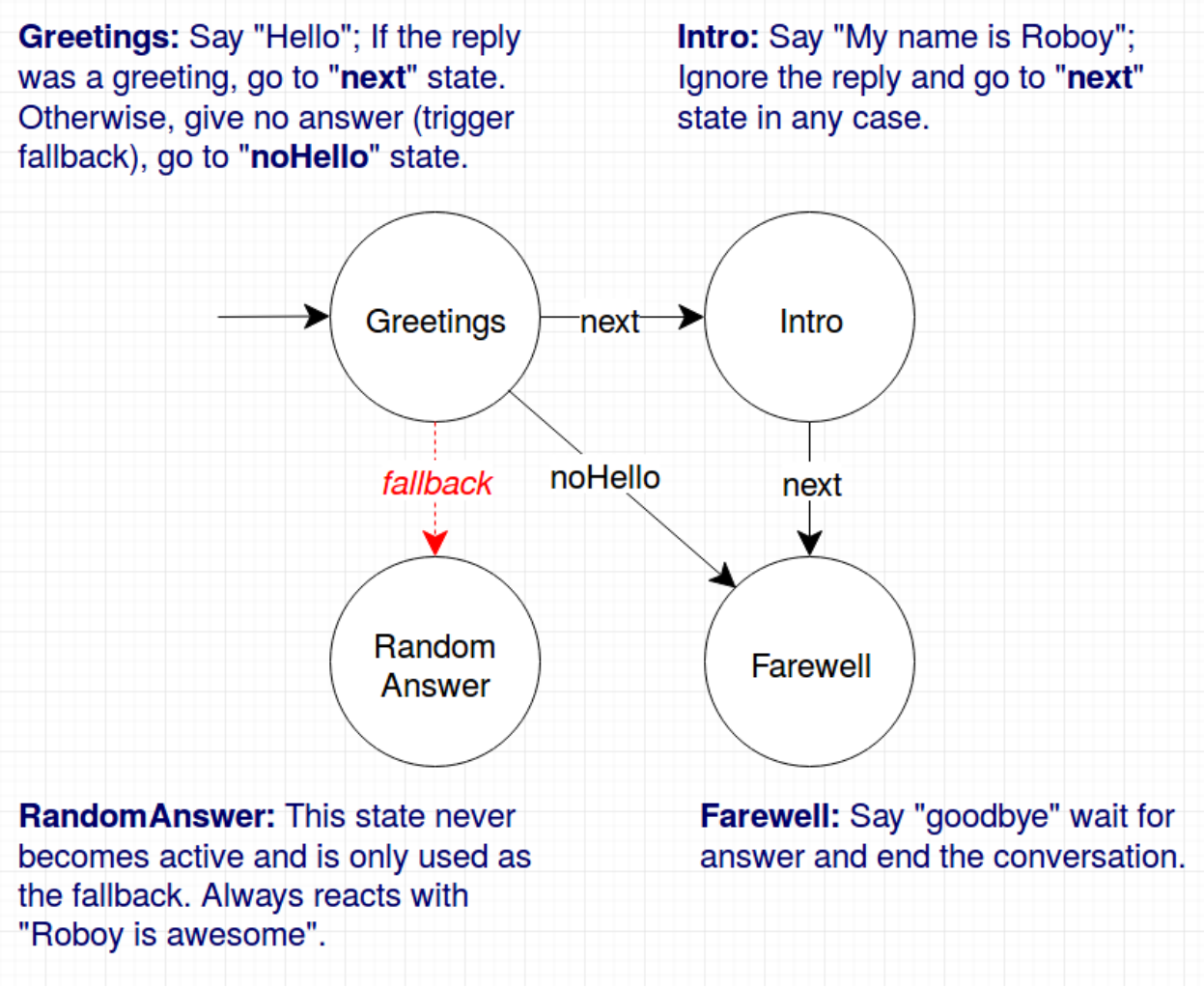
There are two additional properties that you can add to a state definition: `parameters` and `fallback`. Take a look at an example:

```
{
  "identifier": "Intro",
  "implementation": "roboy.dialog.tutorials.tutorialStates.ToyIntroState",
  "transitions": {
    "next": "Farewell"
  },
  "fallback": "RandomAnswer"
  "parameters" : {
    "introductionSentence" : "My name is Roboy!"
  }
}
```

Let's take a look at both properties. Here we define `RandomAnswer` (which is an identifier of another state in the same personality file) as the fallback for the state with identifier `Intro`. This means that if `Intro` cannot react to an input, the `RandomAnswer` will be asked instead. The property `parameters` allows you to pass parameters to the state. Each parameter has a name (here `introductionSentence`) and a string value. The state implementation can access the value by the name. Parameters are very useful to pass resource file paths to states. Read more about fallbacks and parameters on the *Personality and states* page.

Larger personality

It is not easy to create interesting conversations using only two states (assuming relatively simple states of course). Usually, you will use at least five different states in one conversation. To get some experience in writing personality files, let's create a file that uses four states. Don't worry, you don't have to implement the states here. We will use four already pre-implemented toy states that can be found in the `roboy.dialog.tutorials.tutorialStates` package. The final personality should look like this:



alt Toy personality

As you can see, we have four states that are connected to each other. The names of the transitions are denoted on the arrows. Now, try to write a personality file to represent this personality. Following these steps might be helpful:

- read the JavaDoc of every state you will use (`ToyGreetingsState`, `ToyIntroState`, `ToyFarewellState` and `ToyRandomAnswerState`)

- create a new personality file (you might copy `MathTest.json` to have an easier start)
- create four state definitions with different identifiers (`Greetings`, `Intro`, `Farewell` and `RandomAnswer`)
- define the initial state of your personality (`Greetings`)
- define the transitions between the states (note that fallback is not a transition)
- define the fallback for the `Greetings` state
- define required parameters for the `Intro` state (read JavaDoc of `ToyIntroState` for details)
- save the file in the `resources/peronalityFiles` folder
- edit the `config.properties` file and change `PERSONALITY_FILE` to your path
- try running the Dialog System

If anything goes wrong, you can always take a look at the solution saved in `resources/peronalityFiles/tutorial/ToyStateMachine.json`. Happy personalizing!

Why do we need this complexity?

You might be wondering why such a complex system with all those JSON files is needed. It would be much simpler to define all the states and transitions directly from core, right? Defining everything from code would indeed simplify the refactoring. However, definitions inside personality files have some essential advantages. First, you don't have to recompile the project just to change a personality. Second, in the future, we plan to implement a graphical editor for personalities and therefore need a file format to store the personalities. Using the editor, you will be able to create your own personality with drag & drop and don't have to worry about writing the personality files manually anymore.

While the editor is not implemented yet, we still have good news for you. You *can* define personalities directly from code and don't have to worry about creating a personality file (and updating it while refactoring). This feature is especially useful when writing unit tests for single states or smaller state machines. This tutorial does not cover creating personalities from code but there are good examples in the `roboy.dialog.tutorials.StateMachineExamples` class. Take a look at it if you need to define personalities from code.

3.3.3 Adding New Questions to the State

There exists a list of questions, we may want Roboy to ask in order to acquire new information about people and the environment. It is stored in the resources directory under sentences/QAList.json and follows the next JSON structure as given:

"FRIEND_OF": {

"Q": ["Who is your best friend?", "Have I met any of your friends?", "Do you have a friend whom I have met?", "Maybe I know some friends of yours. Would you name one?"

], "A": {

"SUCCESS": ["Oh, I believe I have met %s they're nice."

], "FAILURE": [

"I don't think I know them."

]

}, "FUP": {

"Q": ["Have you made any new friends, %s?"

], "A": [

"Oh, I have met %s they're nice."

]

}

}

Here, we have a set of questions about friends ("FRIEND_OF" intent), so Roboy can learn about friends of the person he is talking to. "SUCCESS" and "FAILURE" are the answerS, Roboy will say if the information input was processed successfully or not, respectively. Follow up questions ("FUP") are the ones that are used to update the information in the future if the questions ("Q") were already asked.

We can add a new entry there with a new intent. Let it be "LIKE":

"LIKE": {

"Q": ["What do you like?"

], "A": {

"SUCCESS": ["Me too. I really like %s!"

], "FAILURE": [

"Well, I do not know what to think about this"

]

}, "FUP": {

"Q": ["Do you still like, %s?"

], "A": [

"Maybe, I should consider liking this stuff"

]

}

}

Then we have to add a new entry into our local ontology - Neo4jRelationships:

```
public enum Neo4jRelationships {
    ...
    LIKE("LIKE");

    ...
}
```

Go back to your state and inside the act() method implement the following logic:

```
Interlocutor person = getContext().ACTIVE_INTERLOCUTOR.getValue();

RandomList<String> questions = qaValues.getQuestions(Neo4jRelationships.LIKE);
String question = questions.getRandomElement();
return State.Output.say(question);
```

Now, we can ask these newly added questions and later process the answers in the react() method.

3.3.4 Querying the Memory from the Dialog System

Indeed, the newly created state may be the pinnacle of State Machines practice, but it does not yet exploit all of the Roboy Dialog System capabilities, such as the graph database Roboy Memory Module which allows to store and recall information about the environment. For instance, you may want to check whether you belong to the circle of Roboy's friends.

Every state is bundled with the memory reference inside its parameters, to call the memory you have to access it the following way:

```
Neo4jMemoryInterface memory = getParameters().getMemory();
```

Then you may want to call one of the most used methods, namely, getById - which will query the Neo4j database and get the description of the node with the same (unique) ID in JSON format. Roboy's ID is 26.:

```
String requestedObject = getMemory().getById(26);
MemoryNodeModel roboy = gson.fromJson(requestedObject, MemoryNodeModel.class);
```

The MemoryNodeModel class is the general class which is a model for the nodes stored in Neo4j. It has a label, an ID, parameters and relationships with other nodes denoted by IDs. As soon as we have the Roboy node we can get his friends' IDs like this:

ArrayList<Integer> ids = roboy.getRelationships(Neo4jRelationships.FRIEND_OF);

Then we can proceed with checking Roboy's friends as follows:

```
RandomList<MemoryNodeModel> roboyFriends = new RandomList<>();

if (ids != null && !ids.isEmpty()) {
    try {
        Gson gson = new Gson();
        for (Integer id : ids) {
            String requestedObject = getParameters().getMemory().getById(id);
            roboyFriends.add(gson.fromJson(requestedObject, MemoryNodeModel.class));
        }
    } catch (InterruptedException | IOException e) {
        logger.error("Error on Memory data retrieval: " + e.getMessage());
    }
}
```

Let's check if we are friends with him:

```
if (!roboyFriends.isEmpty()) {
    for (MemoryNodeModel friend : roboyFriends) {
        if (friend.getProperties().get("name").toString() == myName) {
            success = true;
            break;
        }
    }
}
```

However, there exists a special Roboy node class initialized in a specific way like this:

```
Roboy roboy = new Roboy(memory);
```

It will retrieve and fill all the data for Roboy from the memory.

Furthermore, we wanted to make it less of miserable routine thus there is a helper function in the State superclass, which makes your life much easier:

```
RandomList<MemoryNodeModel> nodes = retrieveNodesFromMemoryByIds(roboy.
↪getRelationships(Neo4jRelationships.FRIEND_OF));

if (!nodes.isEmpty()) {
    for (MemoryNodeModel node : nodes) {
        if (node.getProperties().get("name").toString() == myName) {
            success = true;
            break;
        }
    }
}
```

3.3.5 Creating a Value History / Storing and Updating Values in the Context

See *Context*

3.3.6 Extending the Lexicon and the Grammar

This tutorial explains how to create or change grammar and lexicon used in the semantic parser.

To create your own custom lexicon, you need to create a new file or copy an existing lexicon and add lexemes in the following format:

```
{lexeme:"LEXEME", formula:"FORMULA", type:"TYPE"}
```

where:

- lexeme - is a natural language utterance, e.g., name
- formula - is a semantic representation of the lexeme, e.g., rb:HAS_NAME
- type - is a lexeme type, e.g., NamedEntity, fb:type.any

Additionally, you can also add features in JSON format for map:

```
{lexeme:"name", formula:"rb:HAS_NAME", type:"DataProperty", features:"{feature1:0.5,␣
↪feature2:0.3}"}
```

To create your own custom grammar, you need to create a new file or copy existing grammar and add rules in the following format:

```
(rule [Category] ([Expression]) ([Function]))
```

where:

- Category - is a category of rule, for root derivation use $ROOT
- Expression - is a format of text accepted by the rule expressed in your custom categories or names, e.g., $PHRASE, $TOKEN, $Expr
- Function - semantic function that should be applied to specified pattern, e.g., IdentityFn

Example rules:

```
(rule $ROOT ((what optional) (is optional) $Expr (? optional)) (IdentityFn))
(rule $Expr ($Expr $Conversion) (JoinFn backward))
```

For in-depth tutorial on expression and function types, refer to original SEMPRE tutorial or documentation

To use created files, you need to set the correct parameter in `pom.xml` file. For grammar:

```
-Grammar.inPaths
```

For lexicon:

```
-SimpleLexicon.inPaths
```

3.3.7 Scoring Functions and Knowledge Retrieval

Currently, our semantic parser uses error retrieval mechanism that can be modified in the following steps:

1. Move to package:

   ```
   edu.stanford.nlp.sempre.roboy.score
   ```

2. Implement `edu.stanford.nlp.sempre.roboy.score.ScoringFunction` class with score method.
3. Add scoring function in constructor of `edu.stanford.nlp.sempre.roboy.ErrorRetrieval` class.

1. Move to package:

   ```
   edu.stanford.nlp.sempre.roboy.error
   ```

2. Implement `edu.stanford.nlp.sempre.roboy.error.KnowledgeRetriever` class with analyze method.
3. Add knowledge retriever in constructor of `edu.stanford.nlp.sempre.roboy.ErrorRetrieval` class.

3.3.8 Editing the Config File

Dialog System is configured using the `config.properties` file in the root of the project.

ROS configuration

Dialog outsources many tasks to other modules implemented in Pyhton or C++ as ROS packages. In the config file you can enabled/disable ROS modules, choose which packages to use, and set the `ROS_MASTER_URI`.

Available ROS packages are:

- `roboy_gnlp` (generative model for answer generation)
- `roboy_memory` (Neo4j graph-based memory)
- `roboy_speech_synthesis` (text to speech using Cerevoice)
- `roboy_speech_recognition` (speech to text using Bing Speech API)
- `roboy_audio` (audio source localization)
- `roboy_vision` (face recogntion & object classification and localization)
- `roboy_face` (triggers emotions)

Example ROS config:

```
ROS_ENABLED: true
ROS_MASTER_IP: 10.183.49.162
ROS_ACTIVE_PKGS:
  - roboy_memory
  - roboy_speech_synthesis
```

Inputs and Outputs

A developer can choose how to interact with the dialog system. For example, for debugging purposes there are command line input and output. Importantly, there can be only one input, but many outputs.

Available inputs are:

- `cmdline`
- `upd` (listens for incoming udp packets in the port specified below)
- `bing` (requires Internet connection and the `roboy_speech_recognition` ROS package)

Arbitraty of the following outputs can be used simultaniously at the runtime::

- `cerevoice` (requires `roboy_speech_synthesis` ROS package)
- `cmdline`
- `ibm` (uses IBM Bluemix, requires Internet connection, user & pass configured below)
- `emotions` (requires `roboy_face` ROS package)
- `udp` (sends packets on the port configure below)

Example IO config:

```
INPUT: cmdline
OUTPUTS:
 - cmdline
 - ibm
 - cerevoice
```

Personality

Here you specify the state machine description store in the JSON file containing personality, i.e. states and transitions between them:

```
PERSONALITY_FILE: "resources/personalityFiles/OrdinaryPersonality.json"
```

Utilities

Configure third party communication ports, credentials, etc.:

```
UDP_IN_SOCKET: 55555
UDP_OUT_SOCKET: 55556
UDP_HOST_ADDRESS: 127.0.0.1

PARSER_PORT: 5000
```

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```
IBM_TTS_USER: x
IBM_TTS_PASS: x
```

Show the GUI with Context contents during runtime:

CONTEXT_GUI_ENABLED: true

3.4 Dialog System Scope

The Roboy Dialog System talks to and logically embeds the Roboy Semantic Parser and the Roboy Memory Module. The Memory Module receives input from RDS in form of ROS messages containing valid JSON string RCS payload which is then parsed internally.

The Semantic Parser receives input in form of an Interpretation via a websocket.

The main input of the Dialog System is either a command line string or a speech-to-text processed string. The main output of the Dialog System is either a command line string or piece of audio data.

For further info refer to in_out.

The scope of the Roboy Dialog System is illustrated in the following diagram:

3.5 Resources

Resources are located in resources folder and comprise important text files containing necessary inputs for the RDS.

3.5.1 JSON Resources

- personality files - contain the description of Roboy's personality:

```
{
  "initialState": "stateIdentifier",
  "states": [
    {
      "identifier": "stateIdentifier",
      "implementation": "roboy.dialog.states.StateImplementation",
      "transitions": {
        "stateTransition": "anotherStateIdentifier"
      },
      "parameters": {
        "stateParameter": "someStringParameter"
      }
    }
  ]
}
```

- question asking lists - contain the personal questions in the following form:

```
"INTENT": {
  "Q": [
     "Question phrasing 1",
```

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```
      "Question phrasing 2",
      "Question phrasing 3"
   ],
   "A": {
      "SUCCESS": [
         "Possible answer on success 1",
         "Possible answer on success 2"
         ],
         "FAILURE": [
            "Possible answer on failure"
         ]
   }
   "FUP": {
     "Q": [
       "Possible question to update the existing information"
     ],
     "A": [
       "Possible answer to the input"
     ]
   }
}
```

3.5.2 CSV Resources

- trivia - funny facts Roboy would love to tell you in the following form:

  keyword;Reddit;The sentence contining the particular fact with regard to the keyword

Warning: There is no positive or negative evidence that the trivia facts work when omitting "Reddit" in the middle!

3.5.3 BIN Resources

- BIN files contain the models for the Roboy Semantic Parser

3.5.4 XML Resources

- contains the configuration for the Roboy Dialog Logger where you can set the logger scope and the means of output

3.6 API

template <V>
interface *roboy*::*context***AbstractValue**

Stores a single value.

On update, the value is overwritten.

Subclassed by *roboy.context.AbstractValueHistory< K, V >*, *roboy.context.ObservableValue< V >*, *roboy.context.Value< V >*

Public Functions

V roboy.context.AbstractValue< V >.getValue()

void roboy.context.AbstractValue< V >.updateValue(V value)

template <K, V>
interface *roboy*::*context***AbstractValueHistory**
Maintains a map containing many values.

These values are accessible over the getLastNValues method, in addition to *AbstractValue* methods.

Public Functions

Map<K, V> roboy.context.AbstractValueHistory< K, V >.getLastNValues(int n)
Return the n newest values in the history.

default int roboy.context.AbstractValueHistory< K, V >.getMaxLimit()
When value count reaches maxLimit, adding a new value deletes the oldest.

Override to change threshold.

int roboy.context.AbstractValueHistory< K, V >.getNumberOfValuesSinceStart()
Returns the total amount of updateValue() calls made on this history.

boolean roboy.context.AbstractValueHistory< K, V >.contains(V value)
Returns if object is present in this history.

boolean roboy.context.AbstractValueHistory< K, V >.purgeHistory()
Empties the current history.

interface *roboy*::*dialog*::*action***Action**
The marker interface for an action.

The interface is empty, since different output devices will require different informations in an action. The most important action is the *SpeechAction* which is used for communication.

Subclassed by *roboy.dialog.action.EmotionAction*, *roboy.dialog.action.FaceAction*, *roboy.dialog.action.SpeechAction*

class *roboy*::*context*::*contextObjects***ActiveInterlocutor** : **public** *roboy*::*context*::*Value*<Interlocutor>
The context value to hold an Interlocutor instance.

class *roboy*::*context*::*contextObjects***ActiveInterlocutorUpdater** : **public** *roboy*::*context*::*InternalUpdater*<*ActiveInterlo*
The interface for DM to replace the Interlocutor value held in the target *ActiveInterlocutor* instance.

Public Functions

roboy.context.contextObjects.ActiveInterlocutorUpdater.ActiveInterlocutorUpdater(Activ

class *roboy*::*util***Agedater**

Public Functions

HashMap<String, Integer> roboy.util.Agedater.determineAge(String datestring)
A helper function to determine the age based on the birthdate.

Java >= 8 specific: java.time.LocalDate, java.time.Period, java.time.ZoneId

Return timeSpans in form of HasMap - years:Integer, months:Integer and days:Integer

Parameters

- `datestring`:

Private Members

final Logger roboy.util.Agedater.LOGGER = LogManager.getLogger()

interface *roboy*::*linguistics*::*sentenceanalysis***Analyzer**

All linguistic analyses implement the *Analyzer* interface.

An analyzer always takes an existing interpretation of a sentence and returns one including its own analysis results (usually an enriched version of the input interpretation).

Subclassed by *roboy.linguistics.sentenceanalysis.AnswerAnalyzer*, *roboy.linguistics.sentenceanalysis.DictionaryBasedSentenceTy*
roboy.linguistics.sentenceanalysis.EmotionAnalyzer, *roboy.linguistics.sentenceanalysis.IntentAnalyzer*,
roboy.linguistics.sentenceanalysis.OntologyNERAnalyzer, *roboy.linguistics.sentenceanalysis.OpenNLPParser*,
roboy.linguistics.sentenceanalysis.OpenNLPPOSTagger, *roboy.linguistics.sentenceanalysis.Preprocessor*,
roboy.linguistics.sentenceanalysis.ProfanityAnalyzer, *roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer*,
roboy.linguistics.sentenceanalysis.SentenceAnalyzer, *roboy.linguistics.sentenceanalysis.SimpleTokenizer*

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.Analyzer.analyze(Interpretation sente

class

Checks the predicate argument structures produced by the *OpenNLPParser* analyzer and looks for possible answers to questions in them.

It creates the outputs Linguistics.OBJ_ANSWER for situations where the answer to the question is in the object of the sentence (e.g. "Frank" in the sentence "I am Frank" to the question "Who are you?") and Linguistics.PRED_ANSWER if it is in the predicate or in the predicate and the object combined (e.g. "swimming" in the answer "I like swimming" to the question "What is your hobby?").

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.AnswerAnalyzer.analyze(Interpretatio

Private Static Attributes

final Logger roboy.linguistics.sentenceanalysis.AnswerAnalyzer.logger = LogManager.getLogge

class *roboy*::*linguistics*::*sentenceanalysis***AnswerAnalyzerTest**

Public Functions

void roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.testName()

void roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.testOccupation()

void roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.testOrigin()

void roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.testHobby()

void roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.testMovie()

Private Functions

String roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.analyze(String sentence)

String roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.analyzePred(String senten

Private Static Attributes

final SimpleTokenizer roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.tokenizer =

final OpenNLPPOSTagger roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.pos = new

final OpenNLPParser roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.parser = new *O*

final AnswerAnalyzer roboy.linguistics.sentenceanalysis.AnswerAnalyzerTest.answer = new *A*

class *roboy*::*context*::*contextObjects***AudioDirection** : **public** *roboy*::*context*::ValueHistory<DirectionVector>

Can hold the history of DirectionVectors sent from Audio.

class *roboy*::*context*::*contextObjects***AudioDirectionUpdater** : **public** *roboy*::*context*::ROSTopicUpdater<DirectionVector, *A*

Pushes new values sent by the Audio ROS topic into the *AudioDirection* value history.

Public Functions

roboy.context.contextObjects.AudioDirectionUpdater.AudioDirectionUpdater(AudioDirectio

Protected Functions

synchronized void roboy.context.contextObjects.AudioDirectionUpdater.update()

RosSubscribers roboy.context.contextObjects.AudioDirectionUpdater.getTargetSubscriber(

class

Using Bing to perform speech to text.

Requires internet connection.

Public Functions

roboy.io.BingInput.BingInput(RosMainNode node)

Input roboy.io.BingInput.listen()

Private Members

RosMainNode roboy.io.BingInput.rosMainNode

class

Uses Bing for text to speech.

Requires internet connection.

Public Functions

void roboy.io.BingOutput.act(List< Action > actions)

void roboy.io.BingOutput.say(String text)

class

Start a conversation with telegram.

Try to detect a greeting or roboy names or some key word that initialize the conversation.

Public Functions

roboy.dialog.states.botboy.BotBoyState.BotBoyState(String stateIdentifiers, StateParam

Output roboy.dialog.states.botboy.BotBoyState.act()

Output roboy.dialog.states.botboy.BotBoyState.react(Interpretation input)

State roboy.dialog.states.botboy.BotBoyState.getNextState()

Private Members

final Logger roboy.dialog.states.botboy.BotBoyState.logger = LogManager.getLogger()

final String roboy.dialog.states.botboy.BotBoyState.TRANSITION_INITIALIZED = "initialized"

State roboy.dialog.states.botboy.BotBoyState.next

class

Should perform the celebrity look-a-like vison input.

Isn't implemented yet.

Public Functions

Input roboy.io.CelebritySimilarityInput.listen()

class

Cerevoice text to speech.

Public Functions

roboy.io.CerevoiceOutput.CerevoiceOutput(RosMainNode node)

void roboy.io.CerevoiceOutput.act(List< Action > actions)

void roboy.io.CerevoiceOutput.say(String text)

Private Members

RosMainNode roboy.io.CerevoiceOutput.rosMainNode

class *roboy*::*dialog***Chatbot**
Temporary class to test new state based personality.

Will be be extended and might replace the old *DialogSystem* in the future.

Public Static Functions

static void roboy.dialog.Chatbot.main(String[] args)

Private Static Attributes

final Logger roboy.dialog.Chatbot.logger = LogManager.getLogger()

interface *roboy*::*io***CleanUp**
Devices that need extra cleaning operation on destruction implement this.

Subclassed by *roboy.io.MultiInputDevice*, *roboy.io.MultiOutputDevice*, *roboy.io.TelegramInput*

Public Functions

void roboy.io.CleanUp.cleanup()

class
Uses the command line as input device.

Public Functions

Input roboy.io.CommandLineInput.listen()

Protected Functions

void roboy.io.CommandLineInput.finalize()

Private Members

Scanner roboy.io.CommandLineInput.sc = new Scanner(System.in)

class
Uses the command line as output device.

Public Functions

void roboy.io.CommandLineOutput.act(List< Action > actions)

class *roboy*::*linguistics***Concept**

Public Functions

roboy.linguistics.Concept.Concept(String id)

String roboy.linguistics.Concept.getId()

String roboy.linguistics.Concept.toString()

boolean roboy.linguistics.Concept.equals(Object obj)

int roboy.linguistics.Concept.hashCode()

Private Members

String roboy.linguistics.Concept.id

class *roboy*::*util***ConfigManager**

Public Static Attributes

boolean roboy.util.ConfigManager.ROS_ENABLED = false

String roboy.util.ConfigManager.ROS_MASTER_IP = "127.0.0.1"

List<String> roboy.util.ConfigManager.ROS_ACTIVE_PKGS = new ArrayList<>()

String roboy.util.ConfigManager.ACTION_CLIENT_SCRIPT = "/home/roboy/workspace/Roboy/src/roboy_dialo

boolean roboy.util.ConfigManager.DEBUG = true

String roboy.util.ConfigManager.INPUT = "cmdline"

List<String> roboy.util.ConfigManager.OUTPUTS = new ArrayList<>()

String roboy.util.ConfigManager.UDP_HOST_ADDRESS = "127.0.0.1"

int roboy.util.ConfigManager.UDP_IN_SOCKET = 55555

int roboy.util.ConfigManager.UDP_OUT_SOCKET = 55556

DatagramSocket roboy.util.ConfigManager.DATAGRAM_SOCKET

int roboy.util.ConfigManager.PARSER_PORT = -1

String roboy.util.ConfigManager.PERSONALITY_FILE = "resources/personalityFiles/tutorial/ToyStateMachine.j

String roboy.util.ConfigManager.IBM_TTS_USER = ""

String roboy.util.ConfigManager.IBM_TTS_PASS = ""

boolean roboy.util.ConfigManager.CONTEXT_GUI_ENABLED = false

String roboy.util.ConfigManager.TELEGRAM_API_TOKENS_FILE = ""

Package Static Functions

roboy.util.ConfigManager.[static initializer]()

Private Static Functions

static void roboy.util.ConfigManager.initializeConfig()
This function reads the YAML config file and initializes all fields.

It is called only once at the beginning

Private Static Attributes

String roboy.util.ConfigManager.yamlConfigFile = "config.properties"

class *roboy*::*context***Context**
Singleton class serving as an interface to access all context objects.

Takes care of correct initialization. For usage examples, check out ContextTest.java

Public Functions

roboy.context.Context.Context()
Builds the class to instance maps.

void roboy.context.Context.initializeROS(RosMainNode ros)
Starts up the external updaters (which need a ROS main node).

Parameters

- ros:

Public Members

new *ValueInterface*<>(new *FaceCoordinates*())]

new *ValueInterface*<>(new *ActiveInterlocutor*())]

new *HistoryInterface*<>(new *DialogTopics*())]

new *HistoryInterface*<>(new *DialogIntents*())]

new *HistoryInterface*<>(new *AudioDirection*())]

new *HistoryInterface*<>(new *ROSTest*())]

new *HistoryInterface*<>(new *ValueHistory*<Integer>())]

final DialogTopicsUpdater roboy.context.Context.DIALOG_TOPICS_UPDATER

final DialogIntentsUpdater roboy.context.Context.DIALOG_INTENTS_UPDATER

final ActiveInterlocutorUpdater roboy.context.Context.ACTIVE_INTERLOCUTOR_UPDATER

final OtherQuestionsUpdater roboy.context.Context.OTHER_QUESTIONS_UPDATER

Package Attributes

Logger roboy.context.Context.LOGGER = LogManager.getLogger()

Private Functions

void roboy.context.Context.addToGUI(Object... elements)

Private Members

final Object roboy.context.Context.initializationLock = new Object()

final ArrayList roboy.context.Context.guiValues = new ArrayList()

final ArrayList roboy.context.Context.guiHistories = new ArrayList()

boolean roboy.context.Context.rosInitialized = false

AudioDirectionUpdater roboy.context.Context.AUDIO_ANGLES_UPDATER

ROSTestUpdater roboy.context.Context.ROS_TEST_UPDATER

final FaceCoordinatesObserver roboy.context.Context.FACE_COORDINATES_OBSERVER

class *roboy*::*context***ContextGUI**

A simple GUI showing the values and histories in the *Context* with their content.

Public Static Functions

static void roboy.context.ContextGUI.run(List< AbstractValue > values, List< Abstra

Private Functions

roboy.context.ContextGUI.ContextGUI(List< AbstractValue > values, List< AbstractVal

void roboy.context.ContextGUI.prepareGUI()

void roboy.context.ContextGUI.startFrame()

void roboy.context.ContextGUI.updateValues()

void roboy.context.ContextGUI.updateHistories()

Private Members

JFrame roboy.context.ContextGUI.mainFrame

TitledBorder roboy.context.ContextGUI.valueBorder

JPanel roboy.context.ContextGUI.valuePanel

Map<AbstractValue, JLabel> roboy.context.ContextGUI.valueDisplays

Map<AbstractValueHistory, JScrollPane> roboy.context.ContextGUI.historyDisplays

TitledBorder roboy.context.ContextGUI.historyBorder

JPanel roboy.context.ContextGUI.historyPanel

JPanel roboy.context.ContextGUI.controlPanel

List<AbstractValue> roboy.context.ContextGUI.values

List<AbstractValueHistory> roboy.context.ContextGUI.histories

Private Static Attributes

int roboy.context.ContextGUI.MAX_HISTORY_VALUES = 50

int roboy.context.ContextGUI.FULL_WIDTH = 600

int roboy.context.ContextGUI.FULL_HEIGHT = 600

int roboy.context.ContextGUI.ATTR_WIDTH = 590

int roboy.context.ContextGUI.ATTR_HEIGHT = 80

int roboy.context.ContextGUI.HISTORY_HEIGHT = 300

String roboy.context.ContextGUI.NO_VALUE = "<not initialized>"

class *roboy*::*context***ContextIntegrationTest**

Public Functions

void roboy.context.ContextIntegrationTest.initializeRosAndContext()

void roboy.context.ContextIntegrationTest.checkROSTopicUpdating()
This test tests if the context is properly integrated into the external (ROS) environment.

For this test to work, start the TEST_TOPIC subscriber defined under RosSubscribers via ROS_ACTIVE_PKGS: roboy_test in config.properties

Also, publishing needs to be done externally (e.g. manually via [rostopic pub -r 1 /roboy std_msgs/String "data: 'Test'"]).

Private Members

RosMainNode roboy.context.ContextIntegrationTest.ros

Context roboy.context.ContextIntegrationTest.context

class *roboy*::*context***ContextTest**

Public Functions

void roboy.context.ContextTest.setAndGetDialogTopics()

void roboy.context.ContextTest.setAndGetDialogIntents()

void roboy.context.ContextTest.testInterlocutor()

void roboy.context.ContextTest.timestampedHistoryTest()

void roboy.context.ContextTest.historyLimitExceededTest()

void roboy.context.ContextTest.timestampedHistoryLimitExceededTest()

void roboy.context.ContextTest.testObserver()

void roboy.context.ContextTest.audioDirectionsTest()

Package Attributes

Context roboy.context.ContextTest.context = new *Context*()

class *roboy*::*dialog***Conversation** : **public** Thread

A *Conversation* is in charge of leading conversation with an interlocutor.

Its behaviour is defined through the StateBasedPersonality. It communicates with the interlocutor via a MultiInputDevice and a MultiOutputDevice. The List of analyzers is used to make the input string machine understandable.

Public Functions

roboy.dialog.Conversation.Conversation(StateBasedPersonality personality, File personalityFile, MultiInputDevice multiIn, MultiOutputDevice multiOut, List<Analyzer> analyzers)

Parameters

- `personality`: *roboy.dialog.personality.StateBasedPersonality* object.
- `personalityFile`: File that the personality shall be initialized from.
- `multiIn`: Inputs for this conversation to act on.
- `multiOut`: Outputs for this conversation to act to.
- `analyzers`: All analyzers necessary for analyzing the inputs from multiIn. Please provide these in correct order.

void roboy.dialog.Conversation.run()

Package Functions

synchronized void roboy.dialog.Conversation.pauseExecution()

Pauses Thread execution without ending the conversation.

synchronized void roboy.dialog.Conversation.endConversation()

Ends conversation and resets state to initial.

Does not reset gathered information.

synchronized void roboy.dialog.Conversation.resetConversation(Interlocutor person)

Requires the conversation to be stopped.

Resets this conversation so this thread may be reused.

Parameters

- `person`: The interlocutor for this conversation to talk to after the reset.

Private Members

final Logger roboy.dialog.Conversation.logger = LogManager.getLogger("Conversation" + this.getId())

final MultiInputDevice roboy.dialog.Conversation.multiIn

final MultiOutputDevice roboy.dialog.Conversation.multiOut

final List<Analyzer> roboy.dialog.Conversation.analyzers

final File roboy.dialog.Conversation.personalityFile

final StateBasedPersonality roboy.dialog.Conversation.personality

volatile boolean roboy.dialog.Conversation.isRunning = true

volatile boolean roboy.dialog.Conversation.paused = false

List<Action> roboy.dialog.Conversation.actions

class *roboy*::*dialog***ConversationManager**
Central managing node for roboy_dialog.

ConversationManager coordinates conversation dispatching,running and stopping, IO flows and everything else that needs a central contact. *ConversationManager* assumes that it runs on an actual roboy if ROS_ENABLED is true in config.properties.

Public Static Functions

static void roboy.dialog.ConversationManager.main(String[] args)

static void roboy.dialog.ConversationManager.spawnConversation(String uuid)
Creates and spawns a conversation for a chatuser.

Parameters

- `uuid`: should consist of "servicename-[uuid]", if input allows only a single user, set to "local"

Exceptions

- `IOException`: If conversation could not created.

static void roboy.dialog.ConversationManager.pauseConversation(String uuid)
Pauses conversation so it may be resumed via startConversation.

Parameters

- `uuid`: should consist of "servicename-[uuid]", if input allows only a single user, set to "local"

static void roboy.dialog.ConversationManager.stopConversation(String uuid)
Stops conversation thread for uuid.

Parameters

- `uuid`: should consist of "servicename-[uuid]", if input allows only a single user, set to "local"

static void roboy.dialog.ConversationManager.startConversation(String uuid)
Starts a conversation that is paused or stopped.

NOT NECESSARY AFTER SPAWNCONVERSATION

Parameters

- `uuid`: should consist of "servicename-[uuid]", if input allows only a single user, set to "local"

static Long roboy.dialog.ConversationManager.getConversationThreadID(String uuid)
returns the threadID of the conversation with interlocutor uuid

Return null if thread does not exist, threadID otherwise

Parameters

- `uuid`: should consist of "servicename-[uuid]", if input allows only a single user, set to "local"

Protected Static Functions

static void roboy.dialog.ConversationManager.deregisterConversation(Conversation conve
Deregisters a conversation from the conversationmanager.

Should only be called from a conversation when it ends.

Parameters

- `conversation`: The conversation object to be deregistered

Private Static Functions

static Conversation roboy.dialog.ConversationManager.createConversation(RosMainNode ro
Creates and initializes a new conversation thread.

Does not start the thread.

Return *roboy.dialog.Conversation* object. Fully intialized, ready to launch.

Parameters

- `rosMainNode`: ROS node. Set null if ROS_ENABLED=false
- `analyzers`: All analyzers necessary for analyzing the inputs from multiIn. Please provide these in correct order.
- `inference`: Inference engine. The better, the smarter roboy gets.
- `memory`: Roboy memory access. Without, we cannot remember anything and conversations stay shallow.

Exceptions

- `IOException`: In case the IOdevices could not be correctly initialized.

Private Static Attributes

final Logger roboy.dialog.ConversationManager.logger = LogManager.getLogger()

final HashMap<String, Conversation> roboy.dialog.ConversationManager.conversations = new

RosMainNode roboy.dialog.ConversationManager.rosMainNode

List<Analyzer> roboy.dialog.ConversationManager.analyzers

Neo4jMemoryInterface roboy.dialog.ConversationManager.memory

class *roboy*::*context*::*contextObjects***CoordinateSet**
A coordinate set data structure for the interlocutor face.

Public Functions

roboy.context.contextObjects.CoordinateSet.CoordinateSet(double x, double y, double z)

String roboy.context.contextObjects.CoordinateSet.toString()

Package Attributes

final double roboy.context.contextObjects.CoordinateSet.x

final double roboy.context.contextObjects.CoordinateSet.y

final double roboy.context.contextObjects.CoordinateSet.z

class

This state asks the interlocutor whether Roboy should demonstrate one of his abilities.

The abilities include: shake hand, recognize objects, show emotion, move body

Every time this state is entered, Roboy picks one of the abilities (that haven't been demonstrated yet) and asks the interlocutor whether it should be demonstrated. If all abilities were already demonstrated, one is chosen at random. The ability is demonstrated only if the interlocutor said yes (or similar).

Control flow:

- act(): "Would you like to see me doing {ability}?"
- listen()
- react():
  - if answer = yes: demonstrate ability, say final remark, take 'abilityWasDemonstrated' transition
  - otherwise: skip ability, say another final remark, take 'abilityDemonstrationSkipped' transition

DemonstrateAbilitiesState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined:

- abilityWasDemonstrated: following state if the ability was demonstrated
- abilityDemonstrationSkipped: following state if the ability demonstration was skipped 3) No parameters are used.

Public Functions

roboy.dialog.states.expoStates.DemonstrateAbilitiesState.DemonstrateAbilitiesState(Str

Output roboy.dialog.states.expoStates.DemonstrateAbilitiesState.act()

Output roboy.dialog.states.expoStates.DemonstrateAbilitiesState.react(Interpretation i

State roboy.dialog.states.expoStates.DemonstrateAbilitiesState.getNextState()

Protected Functions

Set<String> roboy.dialog.states.expoStates.DemonstrateAbilitiesState.getRequiredTransi

Private Functions

void roboy.dialog.states.expoStates.DemonstrateAbilitiesState.resetAvailableAbilities(
Resets the list of available abilities so that it contains all of them.

RoboyAbility roboy.dialog.states.expoStates.DemonstrateAbilitiesState.selectRandomAbil
Selects one of the abilities from the availableAbilities list at random and removes it from the list.

If the list becomes empty this way, resets it to the initial state

Return one of the available abilities

Private Members

final RandomList<RoboyAbility> roboy.dialog.states.expoStates.DemonstrateAbilitiesStat

RoboyAbility roboy.dialog.states.expoStates.DemonstrateAbilitiesState.activeAbility

State roboy.dialog.states.expoStates.DemonstrateAbilitiesState.nextState

final Logger roboy.dialog.states.expoStates.DemonstrateAbilitiesState.logger = LogManager

Private Static Attributes

final String roboy.dialog.states.expoStates.DemonstrateAbilitiesState.TRANS_ABILITY_DE

final String roboy.dialog.states.expoStates.DemonstrateAbilitiesState.TRANS_ABILITY_SK

class

Roboy Demonstrate Skills State.

This state will:

- offer the interlocutor to ask a general question, mathematical problem
- retrive the semantic parser result
- compose an answer
- fall back in case of failure OR
- offer a joke / an amusing fact
- in case of POSITIVE sentiment say those

ExpoIntroductionState interface: 1) Fallback is required. 2) Outgoing transitions that have to be defined, following state if the question was answered or the joke/fact were told:

- roboy,
- abilities,
- newPerson. 3) No parameters are used.

Public Functions

roboy.dialog.states.expoStates.DemonstrateSkillsState.DemonstrateSkillsState(String st

Output roboy.dialog.states.expoStates.DemonstrateSkillsState.act()

Output roboy.dialog.states.expoStates.DemonstrateSkillsState.react(Interpretation inpu

State roboy.dialog.states.expoStates.DemonstrateSkillsState.getNextState()

Public Static Attributes

final String roboy.dialog.states.expoStates.DemonstrateSkillsState.INTENTS_HISTORY_ID =

Protected Functions

Set<String> roboy.dialog.states.expoStates.DemonstrateSkillsState.getRequiredTransitio

Private Functions

RoboySkillIntent roboy.dialog.states.expoStates.DemonstrateSkillsState.detectSkill(Str

Private Members

final String [] roboy.dialog.states.expoStates.DemonstrateSkillsState.TRANSITION_NAMES

final String [] roboy.dialog.states.expoStates.DemonstrateSkillsState.INTENT_NAMES = TR

final Logger roboy.dialog.states.expoStates.DemonstrateSkillsState.LOGGER = LogManager.getI

State roboy.dialog.states.expoStates.DemonstrateSkillsState.nextState

RoboySkillIntent roboy.dialog.states.expoStates.DemonstrateSkillsState.skillIntent = null

class *roboy*::*linguistics***DetectedEntity**

Public Functions

roboy.linguistics.DetectedEntity.DetectedEntity(int tokenIndex, Entity entity)

Entity roboy.linguistics.DetectedEntity.getEntity()

int roboy.linguistics.DetectedEntity.getTokenIndex()

String roboy.linguistics.DetectedEntity.toString()

boolean roboy.linguistics.DetectedEntity.equals(Object obj)

int roboy.linguistics.DetectedEntity.hashCode()

Private Members

Entity roboy.linguistics.DetectedEntity.entity

int roboy.linguistics.DetectedEntity.tokenIndex

class *roboy*::*context*::*contextObjects***DialogIntents** : **public** *roboy*::*context*::ValueHistory<*IntentValue*>

Store the history of intents.

Public Functions

int roboy.context.contextObjects.DialogIntents.getMaxLimit()

boolean roboy.context.contextObjects.DialogIntents.isAttributePresent(String attribute

class *roboy*::*context*::*contextObjects***DialogIntentsUpdater** : **public** *roboy*::*context*::*InternalUpdater*<*DialogIntents*, *Intent*

Update the history of intents.

Public Functions

roboy.context.contextObjects.DialogIntentsUpdater.DialogIntentsUpdater(DialogIntents t

class *roboy*::*dialog***DialogStateMachine**

State machine to manage dialog states.

State based personality is built on top of this class.

Main functionality of this class enables loading dialog state machines from personality files. There is also an option to save an existing state machine to file.

Personality files are JSON files that define a set of dialog states and transitions between them (see examples in resources/personalityFiles/tutorial/). Every state definition in the file has an identifier and specifies the implementation (class name) for the state. During parsing of the personality file this class will take the class name and create a Java State object using Java reflection.

Subclassed by *roboy.dialog.personality.StateBasedPersonality*

Public Functions

roboy.dialog.DialogStateMachine.DialogStateMachine(InferenceEngine inference, Context

Create an empty *DialogStateMachine*.

Use loadFromFile(...) to load definitions from the personality file after creation. Alternatively you can create and add States to the machine manually from code.

Parameters

- `context`: reference to the context of the conversation this Statemachine belongs to (will be passed accessible to every newly created State object)
- `rosMainNode`: reference to the RosMainNode that will be passed to every newly created State object
- `memory`: reference to Memory that will be passed to every newly created State object

roboy.dialog.DialogStateMachine.DialogStateMachine(InferenceEngine inference, Context

Create an empty OFFLINE *DialogStateMachine* without a reference to the RosMainNode and Memory.

States will not be able to access the RosMainNode and Memory functionality. This constructor is mainly used for testing.

InferenceEngine roboy.dialog.DialogStateMachine.getInference()

Getter for the InferenceEngine to be accessible externally.

Let semblance of intelligence penetrate the mind of Roboy

Return the reference to the inference

Context roboy.dialog.DialogStateMachine.getContext()

State roboy.dialog.DialogStateMachine.getInitialState()

Returns the initial state for this state machine.

Return initial state for this state machine

void roboy.dialog.DialogStateMachine.setInitialState(State initial)

Set the initial state of this state machine.

The state will be automatically added to the machine if not already added. If active state was null, it will be set to the new initial state.

Parameters

- `initial`: initial state

void roboy.dialog.DialogStateMachine.setInitialState(String identifier)
Set the initial state of this state machine using state identifier.

If there is no state with specified identifier, you will get an error message and the initial state will be set to null.

Parameters

- `identifier`: identifier of the state that should become the initial state

State roboy.dialog.DialogStateMachine.getActiveState()
Returns the active state for this state machine.

Return active state for this state machine

void roboy.dialog.DialogStateMachine.setActiveState(State s)
Set the active state of this state machine.

The state will be automatically added to the machine if not already added.

Parameters

- `s`: state to make active

void roboy.dialog.DialogStateMachine.setActiveState(String identifier)
Set the active state using state identifier.

If there is no state with specified identifier, you will get an error message and active state will be set to null.

Parameters

- `identifier`: identifier of the state that should become the active state

State roboy.dialog.DialogStateMachine.getStateByIdentifier(String identifier)
Returns a state with given identifier.

Returns null if no such state was previously added to the machine.

Return state with given identifier or null

Parameters

- `identifier`: identifier of the state to retrieve

void roboy.dialog.DialogStateMachine.addState(State s)
Add a state to this state machine.

Parameters

- `s`: state to add.

void roboy.dialog.DialogStateMachine.loadFromString(String s)
Loads state machine from a JSON string.

The string must be a valid personality (usually loaded from a personality file).

Parameters

- `s`: personality string

void roboy.dialog.DialogStateMachine.loadFromFile(File f)
Loads state machine from a personality file.

File must contain a valid personality definition.

Parameters

- `f`: file with the personality definition

Exceptions

- `FileNotFoundException`: if file is not found

void roboy.dialog.DialogStateMachine.saveToFile(File f)
Save this state machine to a personality file in JSON format.

Parameters

- `f`: file to save

String roboy.dialog.DialogStateMachine.toJsonString()
Creates a JSON string that represents this state machine.

The JSON string is different from the toString representation which is more readable.

Return JSON string that represents this state machine

String roboy.dialog.DialogStateMachine.toString()

boolean roboy.dialog.DialogStateMachine.equals(Object obj)

Private Functions

void roboy.dialog.DialogStateMachine.loadFromJSON(JsonElement json)
Main function that parses a JSON personality object and creates a state machine.

Required properties:

- initialState (string identifier)
- states (array of state definitions) Optional properties:
- comment (personality file comment)

Parameters

- `json`: json object with the personality definition

StateParameters roboy.dialog.DialogStateMachine.parseStateParameters(JsonObject stateJ
Parses parameters from the state json object.

A new instance of StateParameters is created.

Return StateParameters instance with all parameters defined in json object

Parameters

- `stateJsO`: json object representing a state

void roboy.dialog.DialogStateMachine.parseAndCreateStates(JsonArray statesJsA)
Parses every element of the json array and creates a state java object.

State parameters are parsed before the object is created.

Parameters

- `statesJsA`: json array containing states

void roboy.dialog.DialogStateMachine.parseAndSetTransitionsAndFallbacks(JsonArray stat
Parses every element of the json array (containing states).

For every state, finds and sets the fallback if defined. State transitions are also initialized.

Parameters

- `statesJsA`: json array containing states
- `idToState`: initialized hash map that resolves state IDs to state java objects

void roboy.dialog.DialogStateMachine.checkSuccessfulInitialization(HashMap< String, S
For every state in the idToState hash map, check if all required transitions and parameters were initialized correctly.

Also check if all required fallbacks were set.

JsonObject roboy.dialog.DialogStateMachine.toJsonObject()
Creates a JSON object that represents this state machine.

Return JSON object that represents this state machine

Private Members

final Logger roboy.dialog.DialogStateMachine.logger = LogManager.getLogger()

HashMap<String, State> roboy.dialog.DialogStateMachine.identifierToState
maps string identifiers to state objects ("Greeting" -> {GreetingState}) allows to have multiple instances of the same state class with different identifiers ("Greeting2" -> {GreetingState})

State roboy.dialog.DialogStateMachine.activeState

State roboy.dialog.DialogStateMachine.initialState

final RosMainNode roboy.dialog.DialogStateMachine.rosMainNode
RosMainNode will be passed to every state as parameter.

final Neo4jMemoryInterface roboy.dialog.DialogStateMachine.memory

final InferenceEngine roboy.dialog.DialogStateMachine.inference

final Context roboy.dialog.DialogStateMachine.context

HashMap<String, String> roboy.dialog.DialogStateMachine.optionalPersFileInfo
Personality file additional information: everything like comment goes here.

[!!] Do not use it in your State implementation! This info is only stored to make sure we don't lose the comment etc. when saving this dialog state machine to file.

class *roboy*::*dialog***DialogSystem**
This class is deprecated.

It stays in the summer semester 2018 to ensure backward compatibilty with some command line commands. Later it will be removed completely. Use *ConversationManager* instead. Please use ConversationManger instead.

Public Static Functions

static void roboy.dialog.DialogSystem.main(String[] args)

class *roboy*::*context*::*contextObjects***DialogTopics** : **public** *roboy*::*context*::ValueHistory<String>
A value history to hold the utterances from the interlocutor and Roboy.

class *roboy*::*context*::*contextObjects***DialogTopicsUpdater** : **public** *roboy*::*context*::*InternalUpdater*<*DialogTopics*, String>
Updater available to all DM for adding new values to the *DialogTopics* attribute.

Public Functions

roboy.context.contextObjects.DialogTopicsUpdater.DialogTopicsUpdater(DialogTopics targ

class

Checks the sentence type by stupidly looking at the first word of the sentence and hoping that there is a known question word.

Puts the answer in the sentenceType variable of the *Interpretation* object.

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.DictionaryBasedSentenceTypeDetector.

Private Functions

SentenceType roboy.linguistics.sentenceanalysis.DictionaryBasedSentenceTypeDetector.de

class *roboy*::*linguistics*::*sentenceanalysis***DictionaryBasedSentenceTypeDetectorTest**

Public Functions

void roboy.linguistics.sentenceanalysis.DictionaryBasedSentenceTypeDetectorTest.testWh

Private Members

DictionaryBasedSentenceTypeDetector roboy.linguistics.sentenceanalysis.DictionaryBased

SimpleTokenizer roboy.linguistics.sentenceanalysis.DictionaryBasedSentenceTypeDetector

class *roboy*::*context*::*ContextTest***DirVec** : **public** DirectionVector

Public Functions

double roboy.context.ContextTest.DirVec.getAzimutalAngle()

void roboy.context.ContextTest.DirVec.setAzimutalAngle(double v)

double roboy.context.ContextTest.DirVec.getPolarAngle()

void roboy.context.ContextTest.DirVec.setPolarAngle(double v)

RawMessage roboy.context.ContextTest.DirVec.toRawMessage()

Package Attributes

double roboy.context.ContextTest.DirVec.azimutal_angle

double roboy.context.ContextTest.DirVec.polar_angle

class
A phonetic encoder using the method double metaphone that maps words to their phonetic base form so that words that are written differently but sound similar receive the same form.

This is intended to be used to correct terms that Roboy misunderstood, but currently is not is use.

Public Functions

roboy.linguistics.phonetics.DoubleMetaphoneEncoder.DoubleMetaphoneEncoder(DoubleMetaph

String roboy.linguistics.phonetics.DoubleMetaphoneEncoder.encode(String input)

Package Attributes

DoubleMetaphone roboy.linguistics.phonetics.DoubleMetaphoneEncoder.doubleMetaphone

class

Public Functions

roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState.DoYouKnowMathState(String sta

Output roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState.act()

Output roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState.react(Interpretation i

State roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState.getNextState()

Private Members

State roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState.next

class
Implements the high-level-querying tasks to the *Memory* services.

Public Functions

roboy.memory.DummyMemory.DummyMemory()

boolean roboy.memory.DummyMemory.save(MemoryNodeModel node)
This function is a dummy to use without ROS connetion to *Neo4jMemory*.

Return true for success, false for fail

Parameters

- `node`: Node with a set ID, and other properties to be set or updated.

String roboy.memory.DummyMemory.getById(int id)
This function is a dummy to use without ROS connetion to *Neo4jMemory*.

Return Node representation of the result.

Parameters

- `id`: the ID of requested

ArrayList<Integer> roboy.memory.DummyMemory.getByQuery(MemoryNodeModel query)
This function is a dummy to use without ROS connection to *Neo4jMemory*.

Return Array of IDs (all nodes which correspond to the pattern).

Parameters

- `query`: the ID of requested

int roboy.memory.DummyMemory.create(MemoryNodeModel query)

boolean roboy.memory.DummyMemory.remove(MemoryNodeModel query)
This function is a dummy to use without ROS connetion to *Neo4jMemory*.

Parameters

- `query`: StrippedQuery avoids accidentally deleting other fields than intended.

Private Static Attributes

final Logger roboy.memory.DummyMemory.logger = LogManager.getLogger()

class
Action used if the dialogue manager wants Roboy to express a certain emotional expression, like being angry, neutral or moving its lips (speak).

Public Functions

roboy.dialog.action.EmotionAction.EmotionAction(String state)
Constructor.

Duration is set to 1.

Parameters

- `state`: The emotional expression. Possible values: angry, neutral, speak Please use RoboyEmotions instead of state Strings.

roboy.dialog.action.EmotionAction.EmotionAction(RoboyEmotion state)
Constructor.

Duration is set to 1.

Parameters

- `state`: The emotional expression. Please refer *roboy.emotions.RoboyEmotion* for supported emotions.

roboy.dialog.action.EmotionAction.EmotionAction(String state, int duration)
Constructor.

Parameters

- `state`: The emotional expression. Possible values: angry, neutral, speak
- `duration`: How long Roboy should display the given emotional expression

roboy.dialog.action.EmotionAction.EmotionAction(RoboyEmotion state, int duration)
Constructor.

Duration is set to 1.

Parameters

- `state`: The emotional expression. Possible values: angry, neutral, speak
- `duration`: How long Roboy should display the given emotional expression

String roboy.dialog.action.EmotionAction.getState()

int roboy.dialog.action.EmotionAction.getDuration()

Private Members

String roboy.dialog.action.EmotionAction.state

int roboy.dialog.action.EmotionAction.duration

class
Checks for a handfull of keywords and stores more or less fitting emotions in the Linguistics.EMOTION feature that is later read out and fed to the facial expression output module.

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.EmotionAnalyzer.analyze(Interpretati

class
Roboy's facial expression output.

Public Functions

roboy.io.EmotionOutput.EmotionOutput(RosMainNode node)

void roboy.io.EmotionOutput.act(List< Action > actions)

void roboy.io.EmotionOutput.act(Action action)

Private Members

RosMainNode roboy.io.EmotionOutput.rosMainNode

class *roboy*::*linguistics*Entity

Public Functions

roboy.linguistics.Entity.Entity(String term)

roboy.linguistics.Entity.Entity(String key, String term)

String roboy.linguistics.Entity.getForm(String form)

String roboy.linguistics.Entity.getBaseForm()

Map<String,String> roboy.linguistics.Entity.getForms()

String roboy.linguistics.Entity.toString()

boolean roboy.linguistics.Entity.equals(Object obj)

int roboy.linguistics.Entity.hashCode()

Private Members

Map<String,String> roboy.linguistics.Entity.forms

class

Expo Introduction State.

This state will:

- ask the interlocutor for his name
- create and update the interlocutor in the context
- take one transition: roboyInfo

ExpoIntroductionState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined, following state if Roboy introduced himself:

- skills,
- roboy,
- abilities,
- newPerson. 3) Used 'infoFile' parameter containing Roboy answer phrases. Requires a path to RoboyInfoList.json

Public Functions

roboy.dialog.states.expoStates.ExpoIntroductionState.ExpoIntroductionState(String stat

Output roboy.dialog.states.expoStates.ExpoIntroductionState.act()

Output roboy.dialog.states.expoStates.ExpoIntroductionState.react(Interpretation input

State roboy.dialog.states.expoStates.ExpoIntroductionState.getNextState()

Public Static Attributes

final String roboy.dialog.states.expoStates.ExpoIntroductionState.INTENTS_HISTORY_ID = '

Private Functions

String roboy.dialog.states.expoStates.ExpoIntroductionState.getNameFromInput(Interpret

String roboy.dialog.states.expoStates.ExpoIntroductionState.getRoboyFactsPhrase(Roboy

String roboy.dialog.states.expoStates.ExpoIntroductionState.getIntroPhrase()

String roboy.dialog.states.expoStates.ExpoIntroductionState.getResponsePhrase(String n

State roboy.dialog.states.expoStates.ExpoIntroductionState.getTransitionRandomly(Strin

void roboy.dialog.states.expoStates.ExpoIntroductionState.updateInterlocutorInContext(

Private Members

final String roboy.dialog.states.expoStates.ExpoIntroductionState.SELECTED_SKILLS = "skill

final String roboy.dialog.states.expoStates.ExpoIntroductionState.SELECTED_ABILITIES = "

final String roboy.dialog.states.expoStates.ExpoIntroductionState.SELECTED_ROBOY_QA = "r

final String roboy.dialog.states.expoStates.ExpoIntroductionState.LEARN_ABOUT_PERSON = "

final String roboy.dialog.states.expoStates.ExpoIntroductionState.INFO_FILE_PARAMETER_

final Logger roboy.dialog.states.expoStates.ExpoIntroductionState.LOGGER = LogManager.getLo

"Oh wow.. Sorry for my confusion today. But what's your name?", "Mamma mia. So many people passing by today. Good you stopped by to talk to me. Could you tell me your name?", "Ehm, sorry.. Who am I currently talking to? These lights are so bright I cant see your face")]

final RandomList<String> roboy.dialog.states.expoStates.ExpoIntroductionState.responsel

QAJsonParser roboy.dialog.states.expoStates.ExpoIntroductionState.infoValues

State roboy.dialog.states.expoStates.ExpoIntroductionState.nextState

class

Used for Hannover Messe 2018 states.

Extends the *State* class of the dialog state system. Expo dialog states that require probabilistic transitioning should extend this class. Uses uniform distribution.

Extends the *State* class with:

- getTransitionRandomly - chooses a named transition randomly from the transition names and intent names.
- chooseIntentAttribute - chooses the attribute of the intent randomly, so that it is not similar to the last ones.
- lastNIntentsContainAttribute - checks if the last N IntentValues of the IntentsHistory contain the given attribute.

Subclassed by *roboy.dialog.states.expoStates.DemonstrateSkillsState*, *roboy.dialog.states.expoStates.ExpoIntroductionState*, *roboy.dialog.states.expoStates.PersonalInformationAskingState*, *roboy.dialog.states.expoStates.RoboyQAState*

Public Functions

roboy.dialog.states.definitions.ExpoState.ExpoState(String stateIdentifier, StateParam

Create a state object with given identifier (state name) and parameters.

The parameters should contain a reference to a state machine for later use. The state will not automatically add itself to the state machine.

Parameters

- `stateIdentifier`: identifier (name) of this state
- `params`: parameters for this state, should contain a reference to a state machine

final State roboy.dialog.states.definitions.ExpoState.getTransitionRandomly(String[] t

Chooses a named transition randomly.

Gets transition names and intent names. Upon choosing the transition checks if the corresponding intent is a valid Neo4jProperty. If so, requests the attribute based on the property and saves property and attribute in the IntentsHistory. If the attribute is unrecoverable, returns the current state. Otherwise, returns the chosen state. When the dice hits a bigger number, returns the current state.

Return transitionNames[i] -> *State*

Parameters

- `transitionNames`:
- `intentNames`:
- `intentsHistoryId`:

Exceptions

- `IllegalArgumentException`:

Private Functions

String roboy.dialog.states.definitions.ExpoState.chooseIntentAttribute(Neo4jProperty p
Chooses the attribute of the intent randomly, so that it is not similar to the last n intents.

Return String containing the chosen value

Parameters

- `predicate`:
- `evaluateLastN`:

boolean roboy.dialog.states.definitions.ExpoState.lastNIntentsContainAttribute(String
Checks if the last N IntentValues of the IntentsHistory contain the given attribute.

Return true if contains otherwise false

Parameters

- `attribute`:
- `n`:

Private Members

final Logger roboy.dialog.states.definitions.ExpoState.LOGGER = LogManager.getLogger()

class *roboy*::*context***ExternalUpdater**
For Values which should be updated upon incoming data or at regular intervals, this class fetches and passes the values.

Subclassed by *roboy.context.PeriodicUpdater< Target >*, *roboy.context.ROSTopicUpdater< Message, Target >*

Protected Functions

abstract void roboy.context.ExternalUpdater.update()

class
Action used if the dialogue manager wants Roboy to express a certain facial expression, like being angry, neutral or moving its lips (speak).

Public Functions

roboy.dialog.action.FaceAction.FaceAction(String state)
Constructor.

Duration is set to 1.

Parameters

- `state`: The facial expression. Possible values: angry, neutral, speak

roboy.dialog.action.FaceAction.FaceAction(RoboyEmotion state)
Constructor.

Duration is set to 1.

Parameters

- `state`: The facial expression. Possible values: angry, neutral, speak

roboy.dialog.action.FaceAction.FaceAction(String state, int duration)
Constructor.

Parameters

- `state`: The facial expression. Possible values: angry, neutral, speak
- `duration`: How long Roboy should display the given facial expression

roboy.dialog.action.FaceAction.FaceAction(RoboyEmotion state, int duration)
Constructor.

Duration is set to 1.

Parameters

- `state`: The facial expression. Possible values: angry, neutral, speak
- `duration`: How long Roboy should display the given facial expression

String roboy.dialog.action.FaceAction.getState()

int roboy.dialog.action.FaceAction.getDuration()

Private Members

String roboy.dialog.action.FaceAction.state

int roboy.dialog.action.FaceAction.duration

class *roboy*::*context*::*contextObjects***FaceCoordinates** : **public** *roboy*::*context*::*ObservableValue*<*CoordinateSet*>
xzy-coordinates of a person in the field of vision.

class *roboy*::*context*::*contextObjects***FaceCoordinatesObserver** : **public** Observer
Currently dummy functionality.

In the future, could trigger the rotation of the head towards the speaker. Observes the last location head was turned towards, and calls action if difference passes a threshold.

TODO: To implement head turning, change the dummy functionality in turnHead() method.

Public Functions

roboy.context.contextObjects.FaceCoordinatesObserver.FaceCoordinatesObserver()

void roboy.context.contextObjects.FaceCoordinatesObserver.update(Observable observable

void roboy.context.contextObjects.FaceCoordinatesObserver.turnHead(double x, double y,

Package Attributes

double roboy.context.contextObjects.FaceCoordinatesObserver.lastUpdatedX

double roboy.context.contextObjects.FaceCoordinatesObserver.lastUpdatedY

double roboy.context.contextObjects.FaceCoordinatesObserver.lastUpdatedZ

long roboy.context.contextObjects.FaceCoordinatesObserver.nextUpdateTime

ExecutorService roboy.context.contextObjects.FaceCoordinatesObserver.executor

Package Static Attributes

double roboy.context.contextObjects.FaceCoordinatesObserver.TRIGGER_DIFFERENCE = 0.5

long roboy.context.contextObjects.FaceCoordinatesObserver.UPDATE_INTERVAL_MILLIS = 10000

class
This state ends the conversation.

FarewellState interface: 1) Fallback is not required. 2) This state has no outgoing transitions. 3) No parameters are used.

Public Functions

roboy.dialog.states.ordinaryStates.FarewellState.FarewellState(String stateIdentifier,

Output roboy.dialog.states.ordinaryStates.FarewellState.act()

Output roboy.dialog.states.ordinaryStates.FarewellState.react(Interpretation input)

State roboy.dialog.states.ordinaryStates.FarewellState.getNextState()

boolean roboy.dialog.states.ordinaryStates.FarewellState.isFallbackRequired()

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.FarewellState.getRequiredTransitionName

Set<String> roboy.dialog.states.ordinaryStates.FarewellState.getRequiredParameterNames

Private Members

State roboy.dialog.states.ordinaryStates.FarewellState.next = null

int roboy.dialog.states.ordinaryStates.FarewellState.loops = 0

Private Static Attributes

final int roboy.dialog.states.ordinaryStates.FarewellState.MAX_LOOP_COUNT = 2

"What a nice conversation! I have to think about everything we" + " were talking about. Let's talk again next time.", "I feel tired now, maybe my battery is low? Let's talk again later.", "Don't you think that the dialog team is amazing? They are happy to " + "tell you more about my system. Just ask one of them!")]

class *roboy*::*util***FileLineReader**

Public Static Functions

static RandomList<String> roboy.util.FileLineReader.readFile(String path)

class

Free TTS text to speech.

Public Functions

roboy.io.FreeTTSOutput.FreeTTSOutput()

void roboy.io.FreeTTSOutput.act(List< Action > actions)

Public Static Functions

static void roboy.io.FreeTTSOutput.main(String[] args)

Private Members

Voice roboy.io.FreeTTSOutput.voice

template <I, V, K, V>
class *roboy*::*context***HistoryInterface**

This is the interface over which *Context* value histories can be queried.

Initialize as static field of the *Context* class. Add your *ValueHistory* implementation class, its key and return types as generic parameters.

Parameters

- <I>: An implementation of *AbstractValueHistory*.
- <K>: The keys used within the History instance.
- <V>: The type of data stored within the History instance.

Public Functions

Map<K, V> roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >
Get n elements saved into the corresponding *ValueHistory* instance (or all elements, if all < n).

V roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.getLast
Get the last element saved into the corresponding *ValueHistory* instance.

int roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.value
Get the total nr of times a new value was saved into the corresponding *ValueHistory* instance.

Note: as histories can be limited in size, less elements might be actually stored than the total.

boolean roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.c
Check if the object exists among the valueHistory values.

boolean roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.p
Removes all the valueHistory values.

Protected Functions

roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.HistoryIn

Protected Attributes

I roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.valueHi

Package Functions

I roboy.context.HistoryInterface< I extends AbstractValueHistory< K, V, K, V >.getCont

class
Uses IBM Cloud text to speech.

Requires internet connection and valid IBM Bluemix credentials.

Public Functions

roboy.io.IBMWatsonOutput.IBMWatsonOutput()

void roboy.io.IBMWatsonOutput.act(List< Action > actions)

void roboy.io.IBMWatsonOutput.say(String text)

Package Attributes

final Logger roboy.io.IBMWatsonOutput.logger = LogManager.getLogger()

Private Members

TextToSpeech roboy.io.IBMWatsonOutput.synthesizer

class

Public Functions

HashMap<Neo4jProperty, String> roboy.logic.Inference.inferProperties(ArrayList< Neo4j
Basic inference method Infers the property information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing properties and inferred data/null if NA

Parameters

- `keys`:

String roboy.logic.Inference.inferProperty(Neo4jProperty key, Interpretation input)
Basic inference method Infers the property information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- `key`:

HashMap<Neo4jRelationship, String> roboy.logic.Inference.inferRelationships(ArrayList<
Basic inference method Infers the relationship information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing relationships and inferred data/null if NA

Parameters

- `keys`:

String roboy.logic.Inference.inferRelationship(Neo4jRelationship key, Interpretation i
Basic inference method Infers the relationship information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- `key`:

HashMap<Neo4jLabel, String> roboy.logic.Inference.inferLabels(ArrayList< Neo4jLabel
Basic inference method Infers the label information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing labels and inferred data/null if NA

Parameters

- `keys`:

String roboy.logic.Inference.inferLabel(Neo4jLabel key, Interpretation input)
Basic inference method Infers the label information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- `key`:

Linguistics.UtteranceSentiment roboy.logic.Inference.inferSentiment(Interpretation inpu
Basic inference method Infers the sentiment of the utterance tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- `input`:

Package Attributes

final Logger roboy.logic.Inference.LOGGER = LogManager.getLogger()

Package Static Attributes

"of course", "go ahead")]

final List<String> roboy.logic.Inference.negativeTokens = Arrays.asList("no", "nope", "later", "not", "

Private Functions

String roboy.logic.Inference.inferName(Interpretation input)

interface *roboy*::*logic***InferenceEngine**
Subclassed by *roboy.logic.Inference*

Public Functions

HashMap<Neo4jProperty, String> roboy.logic.InferenceEngine.inferProperties(ArrayList<
Basic inference method Infers the property information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing properties and inferred data/null if NA

Parameters

- `keys`:

String roboy.logic.InferenceEngine.inferProperty(Neo4jProperty key, Interpretation inpu
Basic inference method Infers the property information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- `key`:

HashMap<Neo4jRelationship, String> roboy.logic.InferenceEngine.inferRelationships(Arra
Basic inference method Infers the relationship information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing relationships and inferred data/null if NA

Parameters

- keys:

String roboy.logic.InferenceEngine.inferRelationship(Neo4jRelationship key, Interpreta

Basic inference method Infers the relationship information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- key:

HashMap<Neo4jLabel, String> roboy.logic.InferenceEngine.inferLabels(ArrayList< Neo4jL

Basic inference method Infers the label information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return HashMap containing labels and inferred data/null if NA

Parameters

- keys:

String roboy.logic.InferenceEngine.inferLabel(Neo4jLabel key, Interpretation input)

Basic inference method Infers the label information with regard to the requested keys, tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- key:

UtteranceSentiment roboy.logic.InferenceEngine.inferSentiment(Interpretation input)

Basic inference method Infers the sentiment of the utterance tries to extract and ground the information from the available Interpretation.

Return String containing inferred result/null if NA

Parameters

- input:

class *roboy*::*logic***InferenceEngineTest**

Public Functions

void roboy.logic.InferenceEngineTest.test()

class *roboy*::*io***Input**

The result of an input device consists of a sentence, if it is an audio device, and an arbitrary map of lists.

Public Functions

roboy.io.Input.Input(String sentence)

roboy.io.Input.Input(String sentence, Interpretation attributes)

String roboy.io.Input.getSentence()

Interpretation roboy.io.Input.getAttributes()

void roboy.io.Input.setAttributes(Interpretation interpretation)

Private Members

String roboy.io.Input.sentence

Interpretation roboy.io.Input.attributes

interface *roboy*::*io***InputDevice**

An input device must listen and return an *Input* object.

Subclassed by *roboy.io.BingInput*, *roboy.io.CelebritySimilarityInput*, *roboy.io.CommandLineInput*, *roboy.io.MultiInputDevice*, *roboy.io.RoboyNameDetectionInput*, *roboy.io.TelegramInput*, *roboy.io.UdpInput*

Public Functions

Input roboy.io.InputDevice.listen()

class

Calls a machine learning model to determine if the utterance of the other person represents one of the learned intents.

Stores the highest scoring intent in the Linguistics.INTENT feature and the score in the Linguistics.INTENT_DISTANCE feature.

Public Functions

roboy.linguistics.sentenceanalysis.IntentAnalyzer.IntentAnalyzer(RosMainNode ros)

Interpretation roboy.linguistics.sentenceanalysis.IntentAnalyzer.analyze(Interpretatio

Private Members

RosMainNode roboy.linguistics.sentenceanalysis.IntentAnalyzer.ros

class *roboy*::*context*::*contextObjects***IntentValue**

The value of the question intent based on Neo4j Relationship or a string.

Referenced by the intents history id to distinguish between the States which pushed the values to the history.

Public Functions

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, Neo4jRel

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, Neo4jPro

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, String i

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, Neo4jRel

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, Neo4jPro

roboy.context.contextObjects.IntentValue.IntentValue(String intentsHistoryId, String i

String roboy.context.contextObjects.IntentValue.getId()

Neo4jRelationship roboy.context.contextObjects.IntentValue.getNeo4jRelationshipValue()

Neo4jProperty roboy.context.contextObjects.IntentValue.getNeo4jPropertyValue()

String roboy.context.contextObjects.IntentValue.getStringValue()

String roboy.context.contextObjects.IntentValue.getAttribute()

boolean roboy.context.contextObjects.IntentValue.equals(Object obj)

int roboy.context.contextObjects.IntentValue.hashCode()

String roboy.context.contextObjects.IntentValue.toString()

Private Members

String roboy.context.contextObjects.IntentValue.id

Neo4jRelationship roboy.context.contextObjects.IntentValue.neo4jRelationshipValue = null

Neo4jProperty roboy.context.contextObjects.IntentValue.neo4jPropertyValue = null

String roboy.context.contextObjects.IntentValue.stringValue

String roboy.context.contextObjects.IntentValue.attribute = null

class

Encapsulates a *MemoryNodeModel* and enables dialog states to easily store and retrieve information about its current conversation partner.

Public Functions

roboy.memory.nodes.Interlocutor.Interlocutor(Neo4jMemoryInterface memory)

void roboy.memory.nodes.Interlocutor.addName(String name)

After executing this method, the person field contains a node that is in sync with memory and represents the interlocutor.

Unless something goes wrong during querying, which would affect the following communication severely.

String roboy.memory.nodes.Interlocutor.getName()

boolean roboy.memory.nodes.Interlocutor.hasRelationship(Neo4jRelationship relationship

ArrayList<Integer> roboy.memory.nodes.Interlocutor.getRelationships(Neo4jRelationship

void roboy.memory.nodes.Interlocutor.saveUzupisProperty(UzupisIntents intent, String v

HashMap<UzupisIntents, String> roboy.memory.nodes.Interlocutor.getUzupisInfo()

void roboy.memory.nodes.Interlocutor.addInformation(Neo4jRelationship relationship, St

Adds a new relation to the person node, updating memory.

RelationshipAvailability roboy.memory.nodes.Interlocutor.checkRelationshipAvailability

Checks if predicates from the input array are available for this interlocutor.

Return one of three: all, some or none available

Parameters

- `rels`: array of predicates to check

HashMap<Boolean, ArrayList<Neo4jRelationship> > roboy.memory.nodes.Interlocutor.getPur

Public Members

boolean roboy.memory.nodes.Interlocutor.FAMILIAR = false

Private Members

HashMap<UzupisIntents,String> roboy.memory.nodes.Interlocutor.uzupisInfo = new HashMap<>()

final Logger roboy.memory.nodes.Interlocutor.LOGGER = LogManager.getLogger()

template <T, V>
class *roboy*::*context***InternalUpdater**

An updater which can be called from inside DM to update a *Value* or *ValueHistory*.

Parameters

- <T>: The target *Value* or *ValueHistory*.
- <V>: The data type stored in the target.

Subclassed by *roboy.context.contextObjects.ActiveInterlocutorUpdater*, *roboy.context.contextObjects.DialogIntentsUpdater*, *roboy.context.contextObjects.DialogTopicsUpdater*, *roboy.context.contextObjects.OtherQuestionsUpdater*

Public Functions

roboy.context.InternalUpdater< T extends AbstractValue< V, V >.InternalUpdater(T targe

synchronized void roboy.context.InternalUpdater< T extends AbstractValue< V, V >.updat

Package Attributes

AbstractValue<V> roboy.context.InternalUpdater< T extends AbstractValue< V, V >.target

class *roboy*::*linguistics*::*sentenceanalysis***Interpretation** : **public** Cloneable

An interpretation of all inputs to Roboy consists of the sentence type and an arbitrary map of features.

Feature names are listed and documented in the class *roboy.linguistics.Linguistics*.

The interpretation class is also used to pass the output information from the states to the verbalizer class.

Public Functions

roboy.linguistics.sentenceanalysis.Interpretation.Interpretation()

roboy.linguistics.sentenceanalysis.Interpretation.Interpretation(String sentence)

roboy.linguistics.sentenceanalysis.Interpretation.Interpretation(String sentence, Inte

roboy.linguistics.sentenceanalysis.Interpretation.Interpretation(SentenceType sentence

roboy.linguistics.sentenceanalysis.Interpretation.Interpretation(Interpretation interp

SentenceType roboy.linguistics.sentenceanalysis.Interpretation.getSentenceType()

```
void roboy.linguistics.sentenceanalysis.Interpretation.setSentenceType(SentenceType se
String roboy.linguistics.sentenceanalysis.Interpretation.getSentence()
void roboy.linguistics.sentenceanalysis.Interpretation.setSentence(String sentence)
List<Triple> roboy.linguistics.sentenceanalysis.Interpretation.getTriples()
void roboy.linguistics.sentenceanalysis.Interpretation.setTriples(List<  Triple  > tri
List<Triple> roboy.linguistics.sentenceanalysis.Interpretation.getSemTriples()
void roboy.linguistics.sentenceanalysis.Interpretation.setSemTriples(List<  Triple  >
List<String> roboy.linguistics.sentenceanalysis.Interpretation.getTokens()
void roboy.linguistics.sentenceanalysis.Interpretation.setTokens(List< String > tokens
String [] roboy.linguistics.sentenceanalysis.Interpretation.getPosTags()
void roboy.linguistics.sentenceanalysis.Interpretation.setPosTags(String[] posTags)
String [] roboy.linguistics.sentenceanalysis.Interpretation.getLemmas()
void roboy.linguistics.sentenceanalysis.Interpretation.setLemmas(String[] lemmas)
List<DetectedEntity> roboy.linguistics.sentenceanalysis.Interpretation.getKeywords()
void roboy.linguistics.sentenceanalysis.Interpretation.setKeywords(List<  DetectedEnti
void roboy.linguistics.sentenceanalysis.Interpretation.addKeyword(DetectedEntity keywo
String roboy.linguistics.sentenceanalysis.Interpretation.getAssociation()
void roboy.linguistics.sentenceanalysis.Interpretation.setAssociation(String associati
Map<SemanticRole, String> roboy.linguistics.sentenceanalysis.Interpretation.getPas()
void roboy.linguistics.sentenceanalysis.Interpretation.setPas(Map<  SemanticRole , Str
String roboy.linguistics.sentenceanalysis.Interpretation.getName()
void roboy.linguistics.sentenceanalysis.Interpretation.setName(String name)
String roboy.linguistics.sentenceanalysis.Interpretation.getCelebrity()
void roboy.linguistics.sentenceanalysis.Interpretation.setCelebrity(String celebrity)
boolean roboy.linguistics.sentenceanalysis.Interpretation.isRoboy()
void roboy.linguistics.sentenceanalysis.Interpretation.setRoboy(boolean roboy)
String roboy.linguistics.sentenceanalysis.Interpretation.getObjAnswer()
void roboy.linguistics.sentenceanalysis.Interpretation.setObjAnswer(String objAnswer)
String roboy.linguistics.sentenceanalysis.Interpretation.getPredAnswer()
void roboy.linguistics.sentenceanalysis.Interpretation.setPredAnswer(String predAnswer
RoboyEmotion roboy.linguistics.sentenceanalysis.Interpretation.getEmotion()
void roboy.linguistics.sentenceanalysis.Interpretation.setEmotion(RoboyEmotion emotion
boolean roboy.linguistics.sentenceanalysis.Interpretation.getProfanity()
void roboy.linguistics.sentenceanalysis.Interpretation.setProfanity(boolean profanity)
String roboy.linguistics.sentenceanalysis.Interpretation.getIntent()
void roboy.linguistics.sentenceanalysis.Interpretation.setIntent(String intent)
```

String roboy.linguistics.sentenceanalysis.Interpretation.getIntentDistance()

void roboy.linguistics.sentenceanalysis.Interpretation.setIntentDistance(String intentI

String roboy.linguistics.sentenceanalysis.Interpretation.getParse()

void roboy.linguistics.sentenceanalysis.Interpretation.setParse(String parse)

String roboy.linguistics.sentenceanalysis.Interpretation.getParseAnswer()

void roboy.linguistics.sentenceanalysis.Interpretation.setParseAnswer(String parseAnswe

String roboy.linguistics.sentenceanalysis.Interpretation.getUnderspecifiedTermQuestion

void roboy.linguistics.sentenceanalysis.Interpretation.setUnderspecifiedTermQuestion(St

String roboy.linguistics.sentenceanalysis.Interpretation.getUnderspecifiedQuestion()

void roboy.linguistics.sentenceanalysis.Interpretation.setUnderspecifiedQuestion(Strin

String roboy.linguistics.sentenceanalysis.Interpretation.getUnderspecifiedAnswer()

void roboy.linguistics.sentenceanalysis.Interpretation.setUnderspecifiedAnswer(String

UtteranceSentiment roboy.linguistics.sentenceanalysis.Interpretation.getSentiment()

void roboy.linguistics.sentenceanalysis.Interpretation.setSentiment(UtteranceSentiment

String roboy.linguistics.sentenceanalysis.Interpretation.getUtteranceType()

void roboy.linguistics.sentenceanalysis.Interpretation.setUtteranceType(String utteran

ParsingOutcome roboy.linguistics.sentenceanalysis.Interpretation.getParsingOutcome()

void roboy.linguistics.sentenceanalysis.Interpretation.setParsingOutcome(ParsingOutcom

String roboy.linguistics.sentenceanalysis.Interpretation.getAnswer()

void roboy.linguistics.sentenceanalysis.Interpretation.setAnswer(String answer)

void roboy.linguistics.sentenceanalysis.Interpretation.addTriple(Triple triple)

void roboy.linguistics.sentenceanalysis.Interpretation.copy(Interpretation interpretat

void roboy.linguistics.sentenceanalysis.Interpretation.put(Interpretation interpretati

String roboy.linguistics.sentenceanalysis.Interpretation.toString()

boolean roboy.linguistics.sentenceanalysis.Interpretation.equals(Object obj)

int roboy.linguistics.sentenceanalysis.Interpretation.hashCode()

Private Members

final Logger roboy.linguistics.sentenceanalysis.Interpretation.LOGGER = LogManager.getLogger

SentenceType roboy.linguistics.sentenceanalysis.Interpretation.sentenceType = null

String roboy.linguistics.sentenceanalysis.Interpretation.sentence = null

List<Triple> roboy.linguistics.sentenceanalysis.Interpretation.triples = null

List<Triple> roboy.linguistics.sentenceanalysis.Interpretation.semTriples = null

List<String> roboy.linguistics.sentenceanalysis.Interpretation.tokens = null

String [] roboy.linguistics.sentenceanalysis.Interpretation.posTags = null

String [] roboy.linguistics.sentenceanalysis.Interpretation.lemmas = null

List<DetectedEntity> roboy.linguistics.sentenceanalysis.Interpretation.keywords = null

String roboy.linguistics.sentenceanalysis.Interpretation.association = null

Map<SemanticRole, String> roboy.linguistics.sentenceanalysis.Interpretation.pas = null

String roboy.linguistics.sentenceanalysis.Interpretation.name = null

String roboy.linguistics.sentenceanalysis.Interpretation.celebrity = null

boolean roboy.linguistics.sentenceanalysis.Interpretation.isRoboy = false

String roboy.linguistics.sentenceanalysis.Interpretation.objAnswer = null

String roboy.linguistics.sentenceanalysis.Interpretation.predAnswer = null

RoboyEmotion roboy.linguistics.sentenceanalysis.Interpretation.emotion = null

boolean roboy.linguistics.sentenceanalysis.Interpretation.profanity = false

String roboy.linguistics.sentenceanalysis.Interpretation.intent = null

String roboy.linguistics.sentenceanalysis.Interpretation.intentDistance = null

String roboy.linguistics.sentenceanalysis.Interpretation.parse = null

String roboy.linguistics.sentenceanalysis.Interpretation.parseAnswer = null

String roboy.linguistics.sentenceanalysis.Interpretation.underspecifiedTermQuestion = nu

String roboy.linguistics.sentenceanalysis.Interpretation.underspecifiedQuestion = null

String roboy.linguistics.sentenceanalysis.Interpretation.underspecifiedAnswer = null

UtteranceSentiment roboy.linguistics.sentenceanalysis.Interpretation.sentiment = null

String roboy.linguistics.sentenceanalysis.Interpretation.utteranceType = null

ParsingOutcome roboy.linguistics.sentenceanalysis.Interpretation.parsingOutcome = null

String roboy.linguistics.sentenceanalysis.Interpretation.answer

class *roboy*::*linguistics*::*sentenceanalysis***InterpretationTest**

Public Functions

void roboy.linguistics.sentenceanalysis.InterpretationTest.setUp()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getSentenceType()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getSentence()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getTriples()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getSemTriples()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getTokens()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getPosTags()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getLemmas()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getKeywords()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getAssociation()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getPas()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getName()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getCelebrity()

void roboy.linguistics.sentenceanalysis.InterpretationTest.isRoboy()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getObjAnswer()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getPredAnswer()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getEmotion()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getIntent()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getIntentDistance()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getParse()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getParseAnswer()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getUnderspecifiedTermQuesti

void roboy.linguistics.sentenceanalysis.InterpretationTest.getUnderspecifiedQuestion()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getUnderspecifiedAnswer()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getSentiment()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getUtteranceType()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getParsingOutcome()

void roboy.linguistics.sentenceanalysis.InterpretationTest.getAnswer()

void roboy.linguistics.sentenceanalysis.InterpretationTest.copy()

Private Members

Interpretation roboy.linguistics.sentenceanalysis.InterpretationTest.analyzedInterpret

Interpretation roboy.linguistics.sentenceanalysis.InterpretationTest.defaultInterpreta

Linguistics.SentenceType roboy.linguistics.sentenceanalysis.InterpretationTest.sentenc

String roboy.linguistics.sentenceanalysis.InterpretationTest.sentence

Triple roboy.linguistics.sentenceanalysis.InterpretationTest.triple

List<Triple> roboy.linguistics.sentenceanalysis.InterpretationTest.triples

List<Triple> roboy.linguistics.sentenceanalysis.InterpretationTest.semTriples

List<String> roboy.linguistics.sentenceanalysis.InterpretationTest.tokens

String [] roboy.linguistics.sentenceanalysis.InterpretationTest.posTags

String [] roboy.linguistics.sentenceanalysis.InterpretationTest.lemmas

Entity roboy.linguistics.sentenceanalysis.InterpretationTest.entity

DetectedEntity roboy.linguistics.sentenceanalysis.InterpretationTest.detectedEntity

List<DetectedEntity> roboy.linguistics.sentenceanalysis.InterpretationTest.keywords

String roboy.linguistics.sentenceanalysis.InterpretationTest.association

Map<Linguistics.SemanticRole, String> roboy.linguistics.sentenceanalysis.Interpretatio

String roboy.linguistics.sentenceanalysis.InterpretationTest.name

String roboy.linguistics.sentenceanalysis.InterpretationTest.celebrity

boolean roboy.linguistics.sentenceanalysis.InterpretationTest.isRoboy

String roboy.linguistics.sentenceanalysis.InterpretationTest.objAnswer

String roboy.linguistics.sentenceanalysis.InterpretationTest.predAnswer

RoboyEmotion roboy.linguistics.sentenceanalysis.InterpretationTest.emotion

String roboy.linguistics.sentenceanalysis.InterpretationTest.intent

String roboy.linguistics.sentenceanalysis.InterpretationTest.intentDistance

String roboy.linguistics.sentenceanalysis.InterpretationTest.parse

String roboy.linguistics.sentenceanalysis.InterpretationTest.parseAnswer

String roboy.linguistics.sentenceanalysis.InterpretationTest.underspecifiedTermQuestio

String roboy.linguistics.sentenceanalysis.InterpretationTest.underspecifiedQuestion

String roboy.linguistics.sentenceanalysis.InterpretationTest.underspecifiedAnswer

Linguistics.UtteranceSentiment roboy.linguistics.sentenceanalysis.InterpretationTest.s

String roboy.linguistics.sentenceanalysis.InterpretationTest.utteranceType

Linguistics.ParsingOutcome roboy.linguistics.sentenceanalysis.InterpretationTest.parsi

String roboy.linguistics.sentenceanalysis.InterpretationTest.answer

class

This state will:

- ask the interlocutor for his name
- query memory if the person is already known
- create and update the interlocutor in the context
- take one of two transitions: knownPerson or newPerson

IntroductionState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined:

- knownPerson: following state if the person is already known
- newPerson: following state if the person is NOT known 3) No parameters are used.

Public Functions

roboy.dialog.states.ordinaryStates.IntroductionState.IntroductionState(String stateIde

Output roboy.dialog.states.ordinaryStates.IntroductionState.act()

Output roboy.dialog.states.ordinaryStates.IntroductionState.react(Interpretation input

State roboy.dialog.states.ordinaryStates.IntroductionState.getNextState()

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.IntroductionState.getRequiredTransitionN

Private Functions

String roboy.dialog.states.ordinaryStates.IntroductionState.getNameFromInput(Interpret
void roboy.dialog.states.ordinaryStates.IntroductionState.updateInterlocutorInContext(
String roboy.dialog.states.ordinaryStates.IntroductionState.getIntroPhrase()
String roboy.dialog.states.ordinaryStates.IntroductionState.getResponsePhrase(String n
String roboy.dialog.states.ordinaryStates.IntroductionState.getRoboyFactsPhrase(Roboy

Private Members

QAJsonParser roboy.dialog.states.ordinaryStates.IntroductionState.infoValues
final String roboy.dialog.states.ordinaryStates.IntroductionState.UPDATE_KNOWN_PERSON =
final String roboy.dialog.states.ordinaryStates.IntroductionState.LEARN_ABOUT_PERSON = '
final Logger roboy.dialog.states.ordinaryStates.IntroductionState.LOGGER = LogManager.getLo
final String roboy.dialog.states.ordinaryStates.IntroductionState.INFO_FILE_PARAMETER_
final RandomList<String> roboy.dialog.states.ordinaryStates.IntroductionState.introPhr
final RandomList<String> roboy.dialog.states.ordinaryStates.IntroductionState.successR
final RandomList<String> roboy.dialog.states.ordinaryStates.IntroductionState.failureR
Neo4jRelationship [] roboy.dialog.states.ordinaryStates.IntroductionState.personPredic
RandomList<Neo4jRelationship> roboy.dialog.states.ordinaryStates.IntroductionState.rob
RandomList<Neo4jProperty> roboy.dialog.states.ordinaryStates.IntroductionState.roboyPr
State roboy.dialog.states.ordinaryStates.IntroductionState.nextState

class *roboy*::*util*IO
Helper class for *IO* related tasks.

Public Static Functions

static List<String> roboy.util.IO.readLinesFromUtf8File(String path)
static MultiInputDevice roboy.util.IO.getInputs(RosMainNode rosMainNode)
static MultiInputDevice roboy.util.IO.getInputs(RosMainNode rosMainNode, String uuid)
static MultiOutputDevice roboy.util.IO.getOutputs(RosMainNode rosMainNode)
static MultiOutputDevice roboy.util.IO.getOutputs(RosMainNode rosMainNode, String uuid

Private Static Attributes

final Logger roboy.util.IO.logger = LogManager.getLogger()

class *roboy*::*util*JsonEntryModel

Public Functions

```
RandomList<String> roboy.util.JsonEntryModel.getQuestions()
Map<String, RandomList<String> > roboy.util.JsonEntryModel.getAnswers()
Map<String, RandomList<String> > roboy.util.JsonEntryModel.getFUP()
```

Package Attributes

```
RandomList<String> roboy.util.JsonEntryModel.Q
Map<String, RandomList<String> > roboy.util.JsonEntryModel.A
Map<String, RandomList<String> > roboy.util.JsonEntryModel.FUP
```

class *roboy*::*util*JsonModel

Package Attributes

```
JsonEntryModel roboy.util.JsonModel.name
JsonEntryModel roboy.util.JsonModel.full_name
JsonEntryModel roboy.util.JsonModel.skills
JsonEntryModel roboy.util.JsonModel.abilities
JsonEntryModel roboy.util.JsonModel.age
JsonEntryModel roboy.util.JsonModel.future
JsonEntryModel roboy.util.JsonModel.FROM
JsonEntryModel roboy.util.JsonModel.HAS_HOBBY
JsonEntryModel roboy.util.JsonModel.LIVE_IN
JsonEntryModel roboy.util.JsonModel.FRIEND_OF
JsonEntryModel roboy.util.JsonModel.STUDY_AT
JsonEntryModel roboy.util.JsonModel.MEMBER_OF
JsonEntryModel roboy.util.JsonModel.WORK_FOR
JsonEntryModel roboy.util.JsonModel.OCCUPIED_AS
JsonEntryModel roboy.util.JsonModel.IS
JsonEntryModel roboy.util.JsonModel.CHILD_OF
JsonEntryModel roboy.util.JsonModel.SIBLING_OF
JsonEntryModel roboy.util.JsonModel.OTHER
JsonEntryModel roboy.util.JsonModel.APPLES
JsonEntryModel roboy.util.JsonModel.ANIMAL
JsonEntryModel roboy.util.JsonModel.WORD
JsonEntryModel roboy.util.JsonModel.COLOR
JsonEntryModel roboy.util.JsonModel.PLANT
```

JsonEntryModel roboy.util.JsonModel.NAME

JsonEntryModel roboy.util.JsonModel.FRUIT

class *roboy*::*memory***Lexicon**
Represents a Protege lexicon.

Public Functions

roboy.memory.Lexicon.Lexicon()

List<LexiconLiteral> roboy.memory.Lexicon.getLiterals(String question, int limit, int

List<LexiconPredicate> roboy.memory.Lexicon.scoreThesePredicates(List< LexiconPredica

List<LexiconLiteral> roboy.memory.Lexicon.addTypeOfOwner(List< LexiconLiteral > resu

List<LexiconLiteral> roboy.memory.Lexicon.scoreLiterals(List< LexiconLiteral > result

List<String> roboy.memory.Lexicon.getPermutations(String question)

Package Functions

String roboy.memory.Lexicon.bestLabelOf(String objlabel, String label1, String permuta

Private Functions

List<LexiconPredicate> roboy.memory.Lexicon.addDomainAndRange(List< LexiconPredicate

Private Members

List<LexiconPredicate> roboy.memory.Lexicon.predicateList

List<LexiconLiteral> roboy.memory.Lexicon.literalList

Boolean roboy.memory.Lexicon.predicateFilled

Boolean roboy.memory.Lexicon.literalFilled

List<String> roboy.memory.Lexicon.permutationList

class *roboy*::*memory***LexiconLiteral** : **public** Comparable<*LexiconLiteral*>
An entity in the lexicon.

Public Functions

roboy.memory.LexiconLiteral.LexiconLiteral()

roboy.memory.LexiconLiteral.LexiconLiteral(String URI, String label, String QuestionMa

roboy.memory.LexiconLiteral.LexiconLiteral(String URI, String label, String QuestionMa

int roboy.memory.LexiconLiteral.compareTo(LexiconLiteral lexlit)

Public Members

List<String> roboy.memory.LexiconLiteral.typeOfOwner

String roboy.memory.LexiconLiteral.URI

String roboy.memory.LexiconLiteral.label

String roboy.memory.LexiconLiteral.QuestionMatch

int roboy.memory.LexiconLiteral.score

Public Static Attributes

public int compare(*LexiconLiteral* lexlit1, *LexiconLiteral* lexlit2) { return lexlit1.compareTo(lexlit2); } }]

class *roboy*::*memory***LexiconPredicate** : **public** Comparable<*LexiconPredicate*>

A relation in the lexicon.

Public Functions

roboy.memory.LexiconPredicate.LexiconPredicate()

roboy.memory.LexiconPredicate.LexiconPredicate(String URI, String Label)

int roboy.memory.LexiconPredicate.compareTo(LexiconPredicate lexpre)

Public Members

List<String> roboy.memory.LexiconPredicate.domains

List<String> roboy.memory.LexiconPredicate.ranges

String roboy.memory.LexiconPredicate.type

String roboy.memory.LexiconPredicate.URI

String roboy.memory.LexiconPredicate.label

String roboy.memory.LexiconPredicate.QuestionMatch

int roboy.memory.LexiconPredicate.score

Public Static Attributes

{ public int compare(*LexiconPredicate* lexpre1, *LexiconPredicate* lexpre2) { return lexpre1.compareTo(lexpre2); } }]

class *roboy*::*linguistics***Linguistics**

Collection of attribute names, enumerations, word lists etc.

related to linguistics.

Public Static Attributes

final List<String> roboy.linguistics.Linguistics.tobe = Lists.stringList("am","are","is","was","were","

final List<String> roboy.linguistics.Linguistics.beMod = Lists.stringList("am","are","is","was","were",

class *roboy*::*util*::**Lists**
Helper class for list related tasks.

Public Static Functions

static List<String> roboy.util.Lists.stringList(String... strings)

class *roboy*::*util*::**Maps**
Helper class for map related tasks.

Public Static Functions

static Map<String,String> roboy.util.Maps.stringMap(String... elements)

static Map<String,Object> roboy.util.Maps.stringObjectMap(Object... elements)

static Map<Integer,String> roboy.util.Maps.intStringMap(Object... elements)

template <T>
interface *roboy*::*memory*::**Memory**
The *Memory* interface contains of methods to save and retrieve information.

Parameters

- `<T>`: the type of information stored

Public Functions

boolean roboy.memory.Memory< T >.save(T object)
Storing the element in the memory.

Return true, if storing was successful

Parameters

- `object`: the element to be stored

Exceptions

- `InterruptedException`:
- `IOException`:

class *roboy*::*memory*::**MemoryIntegrationTest** : **public** TestCase
Basically this class is a mirror copy of *Memory*'s Neo4JTest.

The exact same tests were used, only that instead of calling the functions in memory (few modifications), we call them via *Neo4jMemoryOperations*.

Public Functions

void roboy.memory.MemoryIntegrationTest.testCreateNode()

void roboy.memory.MemoryIntegrationTest.testUpdateNode()

void roboy.memory.MemoryIntegrationTest.testGetNode()

void roboy.memory.MemoryIntegrationTest.testRemove()

void roboy.memory.MemoryIntegrationTest.tearDown()

Package Attributes

Gson roboy.memory.MemoryIntegrationTest.gson = new Gson()

long roboy.memory.MemoryIntegrationTest.timestamp = new Date().getTime()

final String roboy.memory.MemoryIntegrationTest.LUKAS = "{'label':'Person','properties':{'name':'Lucas_

final String roboy.memory.MemoryIntegrationTest.TOBY = "{'label':'Person','properties':{'name':'Tobias_'

final String roboy.memory.MemoryIntegrationTest.ROBOY = "{'label':'Robot','properties':{'name':'Roboy_

class *roboy*::*memory*::*nodes***MemoryNodeModel**

This class represents a full node similarly to its representation in *Memory*.

Subclassed by *roboy.memory.nodes.Interlocutor*, *roboy.memory.nodes.Roboy*

Public Functions

roboy.memory.nodes.MemoryNodeModel.MemoryNodeModel(Neo4jMemoryInterface memory)

roboy.memory.nodes.MemoryNodeModel.MemoryNodeModel(String jsonString, Neo4jMemoryInter

roboy.memory.nodes.MemoryNodeModel.MemoryNodeModel(boolean stripQuery, Neo4jMemoryInte

int roboy.memory.nodes.MemoryNodeModel.getId()

void roboy.memory.nodes.MemoryNodeModel.setId(int id)

ArrayList<Neo4jLabel> roboy.memory.nodes.MemoryNodeModel.getLabels()

void roboy.memory.nodes.MemoryNodeModel.setLabel(Neo4jLabel label)

HashMap<Neo4jProperty, Object> roboy.memory.nodes.MemoryNodeModel.getProperties()

Object roboy.memory.nodes.MemoryNodeModel.getProperty(Neo4jProperty key)

void roboy.memory.nodes.MemoryNodeModel.setProperties(HashMap< Neo4jProperty , Object

void roboy.memory.nodes.MemoryNodeModel.setProperty(Neo4jProperty key, Object property

HashMap<Neo4jRelationship, ArrayList<Integer> > roboy.memory.nodes.MemoryNodeModel.getI

ArrayList<Integer> roboy.memory.nodes.MemoryNodeModel.getRelationship(Neo4jRelationshi

void roboy.memory.nodes.MemoryNodeModel.setRelationships(HashMap< Neo4jRelationship ,

void roboy.memory.nodes.MemoryNodeModel.setRelationships(Neo4jRelationship key, ArrayL

void roboy.memory.nodes.MemoryNodeModel.setRelationship(Neo4jRelationship key, Integer

void roboy.memory.nodes.MemoryNodeModel.setStripQuery(boolean strip)

String roboy.memory.nodes.MemoryNodeModel.toJSON()
This toString method returns the whole object, including empty variables.

MemoryNodeModel roboy.memory.nodes.MemoryNodeModel.fromJSON(String json, Gson gson)
Returns an instance of this class based on the given JSON.

String roboy.memory.nodes.MemoryNodeModel.toString()

Protected Attributes

Neo4jMemoryInterface roboy.memory.nodes.MemoryNodeModel.memory

Package Attributes

transient boolean roboy.memory.nodes.MemoryNodeModel.stripQuery = false

Package Static Attributes

final Logger roboy.memory.nodes.MemoryNodeModel.logger = LogManager.getLogger()

Private Members

int roboy.memory.nodes.MemoryNodeModel.id

ArrayList<String> roboy.memory.nodes.MemoryNodeModel.labels

Neo4jLabel roboy.memory.nodes.MemoryNodeModel.label

HashMap<String, Object> roboy.memory.nodes.MemoryNodeModel.properties

HashMap<String, ArrayList<Integer> > roboy.memory.nodes.MemoryNodeModel.relationships

class
A phonetic encoder using the method metaphone that maps words to their phonetic base form so that words that are written differently but sound similar receive the same form.

This is intended to be used to correct terms that Roboy misunderstood, but currently is not is use.

Public Functions

roboy.linguistics.phonetics.MetaphoneEncoder.MetaphoneEncoder(Metaphone metaphone)

String roboy.linguistics.phonetics.MetaphoneEncoder.encode(String input)

Private Members

Metaphone roboy.linguistics.phonetics.MetaphoneEncoder.metaphone

class *roboy*::*dialog***MiniTestStateMachineCreator**
Helper class for testing: creates a minimal state machine with 2 states.

Public Static Functions

static String roboy.dialog.MiniTestStateMachineCreator.getMiniStateMachineString()
Returns a String representation of a minimal state machine with only two states.

The representation is equal to the machine from *getMiniStateMachine()*.

Return String representation of a minimal state machine with only two states

static DialogStateMachine roboy.dialog.MiniTestStateMachineCreator.getMiniStateMachine
Creates a minimal state machine with only two states from code.

The machine is equal to the String representation from *getMiniStateMachineString()*.

Return a minimal state machine with only two states created from code

class
Meta class to combine multiple input devices.

Public Functions

roboy.io.MultiInputDevice.MultiInputDevice(InputDevice mainInput)

void roboy.io.MultiInputDevice.addInputDevice(InputDevice additionalInput)

Input roboy.io.MultiInputDevice.listen()

void roboy.io.MultiInputDevice.cleanup()
Calls *cleanup()* for every included input device that implements *CleanUp*.

void roboy.io.MultiInputDevice.finalize()

Private Members

InputDevice roboy.io.MultiInputDevice.mainInput

ArrayList<InputDevice> roboy.io.MultiInputDevice.additionalInputs

class
Meta class to combine multiple output devices.

Public Functions

roboy.io.MultiOutputDevice.MultiOutputDevice(OutputDevice device)

void roboy.io.MultiOutputDevice.add(OutputDevice additionalDevice)

void roboy.io.MultiOutputDevice.act(List< Action > actions)

void roboy.io.MultiOutputDevice.cleanup()
Calls cleanup for all devices and removes them from the devices list after cleaning.

void roboy.io.MultiOutputDevice.finalize()

Private Members

ArrayList<OutputDevice> roboy.io.MultiOutputDevice.devices

enum *roboy*::*memory***Neo4jLabel**
Contains the relations available in Neo4j database.

Respective questions should be added to the questions.json file and used in the QuestionRandomizerState.

Public Functions

roboy.memory.Neo4jLabel.Neo4jLabel(String type)

Public Members

roboy.memory.Neo4jLabel.Person =("Person")

roboy.memory.Neo4jLabel.Robot =("Robot")

roboy.memory.Neo4jLabel.Company =("Company")

roboy.memory.Neo4jLabel.University =("University")

roboy.memory.Neo4jLabel.City =("City")

roboy.memory.Neo4jLabel.Country =("Country")

roboy.memory.Neo4jLabel.Hobby =("Hobby")

roboy.memory.Neo4jLabel.Occupation =("Occupation")

roboy.memory.Neo4jLabel.Object =("Object")

roboy.memory.Neo4jLabel.Location =("Location")

roboy.memory.Neo4jLabel.Organization =("Organization")

roboy.memory.Neo4jLabel.Other =("Other")

roboy.memory.Neo4jLabel.None =("")

String roboy.memory.Neo4jLabel.type

Public Static Functions

roboy.memory.Neo4jLabel.[static initializer]()

static Neo4jLabel roboy.memory.Neo4jLabel.lookupByType(String type)

static boolean roboy.memory.Neo4jLabel.contains(String type)

Private Static Attributes

Maps.newHashMapWithExpectedSize(Neo4jLabel.values().length)]

class
Implements the high-level-querying tasks to the *Memory* services.

Public Functions

roboy.memory.Neo4jMemory.Neo4jMemory()

boolean roboy.memory.Neo4jMemory.save(MemoryNodeModel node)
Updating information in the memory for an EXISTING node with known ID.

Return true for success, false for fail

Parameters

- `node`: Node with a set ID, and other properties to be set or updated.

String roboy.memory.Neo4jMemory.getById(int id)
This query retrieves a a single node by its ID.

Return Node representation of the result.

Parameters

- `id`: the ID of requested

ArrayList<Integer> roboy.memory.Neo4jMemory.getByQuery(MemoryNodeModel query)
This is a classical database query which finds all matching nodes.

Return Array of IDs (all nodes which correspond to the pattern).

Parameters

- `query`: the ID of requested

int roboy.memory.Neo4jMemory.create(MemoryNodeModel query)

boolean roboy.memory.Neo4jMemory.remove(MemoryNodeModel query)
IF ONLY THE ID IS SET, THE NODE IN MEMORY WILL BE DELETED ENTIRELY.

Otherwise, the properties present in the query will be deleted.

Parameters

- `query`: StrippedQuery avoids accidentally deleting other fields than intended.

Private Members

Gson roboy.memory.Neo4jMemory.gson = new Gson()

Private Static Attributes

final Logger roboy.memory.Neo4jMemory.logger = LogManager.getLogger()

interface *roboy*::*memory***Neo4jMemoryInterface**
Implements the high-level-querying tasks to the *Memory* services.

Subclassed by *roboy.memory.DummyMemory*, *roboy.memory.Neo4jMemory*

Public Functions

boolean roboy.memory.Neo4jMemoryInterface.save(MemoryNodeModel node)
Updating information in the memory for an EXISTING node with known ID.

Return true for success, false for fail

Parameters

- `node`: Node with a set ID, and other properties to be set or updated.

String roboy.memory.Neo4jMemoryInterface.getById(int id)
This query retrieves a a single node by its ID.

Return String with node representation of the result.

Parameters

- `id`: the ID of requested

ArrayList<Integer> roboy.memory.Neo4jMemoryInterface.getByQuery(MemoryNodeModel query)
This is a classical database query which finds all matching nodes.

Return Array of IDs (all nodes which correspond to the pattern).

Parameters

- `query`: the ID of requested

int roboy.memory.Neo4jMemoryInterface.create(MemoryNodeModel query)

boolean roboy.memory.Neo4jMemoryInterface.remove(MemoryNodeModel query)
IF ONLY THE ID IS SET, THE NODE IN MEMORY WILL BE DELETED ENTIRELY.

Otherwise, the properties present in the query will be deleted.

Parameters

- `query`: StrippedQuery avoids accidentally deleting other fields than intended.

class *roboy*::*memory***Neo4jMemoryOperations**
This Class creates an interface to connect to memory.

Instead of calling via a service via ROS, we simply call the function directly and get returned a JSON string.

Public Static Functions

static String roboy.memory.Neo4jMemoryOperations.get(String query)
Get the Node ID.

Return JSON containing ID of node

Parameters

- `query`: Query to specify Node to get. Ex: {"labels":["Person"],"label":"Person","properties":{"name":"davis"}}

static String roboy.memory.Neo4jMemoryOperations.cypher(String query)
Cypher Method that is never called TODO: Implement this feature or refactor it out, it's kind of here because there was a service.

Return

Parameters

- `query`:

static String roboy.memory.Neo4jMemoryOperations.create(String query)
Create a node.

Return JSON containing the ID of the new node

Parameters

- `query`: Query with data regarding the node. Ex: {"labels":["Organization"],"label":"Organization","properties":{"name":"korn"}}

static String roboy.memory.Neo4jMemoryOperations.update(String query)
Update Nodes.

Return JSON establishing whether or not the connection was made or not

Parameters

- `query`: Query to link two nodes together. Ex: {"labels":["Person"],"label":"Person","properties":{"name":"davis"},"relationships":{"FROM":[369]},"id":368}

static String roboy.memory.Neo4jMemoryOperations.delete(String query)
Delete a Node.

Return Whether or not deleting was successful or not

Parameters

- `query`: JSON query to delete a specified node. Ex: {'type':'node','id':361,'properties_list':['sex'], 'relationships':{'FRIEND_OF':[426]}}

enum *roboy*::*memory***Neo4jProperty**
Contains the relations available in Neo4j database.

Respective questions should be added to the questions.json file and used in the QuestionRandomizerState.

Public Functions

roboy.memory.Neo4jProperty.Neo4jProperty(String type)

Public Members

roboy.memory.Neo4jProperty.name =("name")

roboy.memory.Neo4jProperty.sex =("sex")

roboy.memory.Neo4jProperty.full_name =("full_name")

roboy.memory.Neo4jProperty.age =("age")

roboy.memory.Neo4jProperty.skills =("skills")

roboy.memory.Neo4jProperty.abilities =("abilities")

roboy.memory.Neo4jProperty.future =("future")

roboy.memory.Neo4jProperty.birthdate =(“birthdate”)

roboy.memory.Neo4jProperty.facebook_id =(“facebook_id”)

roboy.memory.Neo4jProperty.telegram_id =(“telegram_id”)

roboy.memory.Neo4jProperty.slack_id =(“slack_id”)

roboy.memory.Neo4jProperty.whatsapp_id =(“whatsapp_id”)

roboy.memory.Neo4jProperty.line_id =(“line_id”)

String roboy.memory.Neo4jProperty.type

Public Static Functions

roboy.memory.Neo4jProperty.[static initializer]()

static Neo4jProperty roboy.memory.Neo4jProperty.lookupByType(String type)

static boolean roboy.memory.Neo4jProperty.contains(String type)

Private Static Attributes

Maps.newHashMapWithExpectedSize(Neo4jProperty.values().length)]

enum *roboy*::*memory***Neo4jRelationship**

Contains the relations available in Neo4j database.

Respective questions should be added to the questions.json file and used in the QuestionRandomizerState.

Public Functions

roboy.memory.Neo4jRelationship.Neo4jRelationship(String type)

Public Members

roboy.memory.Neo4jRelationship.FROM =(“FROM”)

roboy.memory.Neo4jRelationship.HAS_HOBBY =(“HAS_HOBBY”)

roboy.memory.Neo4jRelationship.LIVE_IN =(“LIVE_IN”)

roboy.memory.Neo4jRelationship.STUDY_AT =(“STUDY_AT”)

roboy.memory.Neo4jRelationship.OCCUPIED_AS =(“OCCUPIED_AS”)

roboy.memory.Neo4jRelationship.WORK_FOR =(“WORK_FOR”)

roboy.memory.Neo4jRelationship.FRIEND_OF =(“FRIEND_OF”)

roboy.memory.Neo4jRelationship.MEMBER_OF =(“MEMBER_OF”)

roboy.memory.Neo4jRelationship.CHILD_OF =(“CHILD_OF”)

roboy.memory.Neo4jRelationship.SIBLING_OF =(“SIBLING_OF”)

roboy.memory.Neo4jRelationship.KNOW =(“KNOW”)

roboy.memory.Neo4jRelationship.OTHER =(“OTHER”)

roboy.memory.Neo4jRelationship.IS =("IS")

String roboy.memory.Neo4jRelationship.type

Public Static Functions

static Neo4jLabel roboy.memory.Neo4jRelationship.determineNodeType(Neo4jRelationship r

roboy.memory.Neo4jRelationship.[static initializer]()

static Neo4jRelationship roboy.memory.Neo4jRelationship.lookupByType(String type)

static boolean roboy.memory.Neo4jRelationship.contains(String type)

Private Static Attributes

Maps.newHashMapWithExpectedSize(Neo4jRelationship.values().length)]

template <V>
class *roboy*::*context***ObservableValue** : **public** Observable, **public** *roboy*::*context*::*AbstractValue*<V>

A *Value* that supports adding Observers.

These will be notified whenever a new value is added.

Parameters

- <V>:

Subclassed by *roboy.context.contextObjects.FaceCoordinates*

Public Functions

V roboy.context.ObservableValue< V >.getValue()

synchronized void roboy.context.ObservableValue< V >.updateValue(V value)

Private Members

V roboy.context.ObservableValue< V >.value = null

class

Checks for keywords from a list (knowledgebase/triviaWords.csv) and stores them in Linguistics.KEYWORDS attribute of the interpretation.

Public Functions

roboy.linguistics.sentenceanalysis.OntologyNERAnalyzer.OntologyNERAnalyzer()

Interpretation roboy.linguistics.sentenceanalysis.OntologyNERAnalyzer.analyze(Interpre

Private Members

Map<String,Entity> roboy.linguistics.sentenceanalysis.OntologyNERAnalyzer.entities

class

Performs a sentence analysis using the Open NLP constituency parser, then interprets the output for predicate argument structures (who did what to whom?) and stores them in the Linguistics.PAS attribute of the interpretation.

Public Functions

roboy.linguistics.sentenceanalysis.OpenNLPParser.OpenNLPParser()

Interpretation roboy.linguistics.sentenceanalysis.OpenNLPParser.analyze(Interpretation

StringBuilder roboy.linguistics.sentenceanalysis.OpenNLPParser.parseToString(Parse par

Public Static Functions

static void roboy.linguistics.sentenceanalysis.OpenNLPParser.main(String[] args)

Private Functions

Interpretation roboy.linguistics.sentenceanalysis.OpenNLPParser.extractPAS(Interpretat

Map<SemanticRole, String> roboy.linguistics.sentenceanalysis.OpenNLPParser.top(Parse pa

Map<SemanticRole, String> roboy.linguistics.sentenceanalysis.OpenNLPParser.sbar(Parse

Map<SemanticRole, String> roboy.linguistics.sentenceanalysis.OpenNLPParser.vp(Parse pa

Private Members

Parser roboy.linguistics.sentenceanalysis.OpenNLPParser.parser

class *roboy*::*linguistics*::*sentenceanalysis***OpenNLPParserTest**

Public Functions

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testWhatIs()

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testWhenWas()

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testWhereWas()

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testWhereDid()

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testWhenDid()

void roboy.linguistics.sentenceanalysis.OpenNLPParserTest.testHowAdjective()

Private Static Attributes

final OpenNLPParser roboy.linguistics.sentenceanalysis.OpenNLPParserTest.parser = new *Op*

class

Perform part-of-speech tagging (detecting nouns, verbs etc.) using the Open NLP POS tagger and stores the results in the Linguistics.POSTAGS attribute of the interpretation.

Public Functions

roboy.linguistics.sentenceanalysis.OpenNLPPPOSTagger.OpenNLPPPOSTagger()

Interpretation roboy.linguistics.sentenceanalysis.OpenNLPPPOSTagger.analyze(Interpreta

Private Functions

String [] roboy.linguistics.sentenceanalysis.OpenNLPPPOSTagger.extractPosTag(List< Str

Private Members

POSTaggerME roboy.linguistics.sentenceanalysis.OpenNLPPPOSTagger.tagger

class *roboy*::*context*::*contextObjects***OtherQuestionsUpdater** : **public** *roboy*::*context*::*InternalUpdater*<*AbstractValue*<Inte

Updater available to all DM for adding new values to the *DialogTopics* attribute.

Public Functions

roboy.context.contextObjects.OtherQuestionsUpdater.OtherQuestionsUpdater(AbstractValue

class *roboy*::*dialog*::*states*::*definitions*::*State***Output**

Output static inner class represents the return values of *act()* and *react()* methods.

There are four possible scenarios:

- the state wants to say something -> a single interpretation is returned
- the state does not say anything -> no interpretation
- the state does not know how to react -> fallback state is required to fix this
- the state wants to end the conversation -> reset the whole dialog state machine

To create an instance of this class inside the *act()* or *react()* method use following:

- *Output.say*(new Interpretation(. . .)) - to return an interpretation
- *Output.say*("Some phrase here") - to return an interpretation (will be created from string)
- *Output.sayNothing()* - to make clear that you don't want to say anything
- *Output.useFallback()* - to indicate that you can't react and want to use the fallback
- *Output.endConversation()* - to stop the conversation immediately and reset the state machine
- *Output.endConversation*("last words") - to say the last words and reset the state machine afterwards

Public Functions

boolean roboy.dialog.states.definitions.State.Output.hasInterpretation()

boolean roboy.dialog.states.definitions.State.Output.requiresFallback()

boolean roboy.dialog.states.definitions.State.Output.isEmpty()

boolean roboy.dialog.states.definitions.State.Output.isEndOfConversation()

Interpretation roboy.dialog.states.definitions.State.Output.getInterpretation()

Output roboy.dialog.states.definitions.State.Output.setSegue(Segue s)
A segue is a smooth transition from one topic to the next.

You can add a segues of a specific types to the state output if you want to change the topic. Segues have a certain probabilities to be used and are always added after the original output was said.

Return the same *Output* object so you can chain multiple function calls on it

Parameters

- `s`: segue to add

boolean roboy.dialog.states.definitions.State.Output.hasSegue()

Segue roboy.dialog.states.definitions.State.Output.getSegue()

Output roboy.dialog.states.definitions.State.Output.setEmotion(String emotion)

boolean roboy.dialog.states.definitions.State.Output.hasEmotion()

String roboy.dialog.states.definitions.State.Output.getEmotion()

Public Static Functions

static Output roboy.dialog.states.definitions.State.Output.say(Interpretation i)
Say a phrase.

Return *State.Output* object with appropriate settings

Parameters

- `i`: interpretation object that contains the phrase

static Output roboy.dialog.states.definitions.State.Output.say(String s)
Say a phrase.

Return *State.Output* object with appropriate settings

Parameters

- `s`: phrase to say

static Output roboy.dialog.states.definitions.State.Output.sayNothing()
Say nothing (as the output of *State* act/react).

Return *State.Output* object with appropriate settings

static Output roboy.dialog.states.definitions.State.Output.useFallback()
Indicate that current state has no idea how to react and that the dialog system should use a fallback state to react instead.

This option is only allowed for react(...) output. States should never use this option from the *act()* function.

Return *State.Output* object with appropriate settings

static Output roboy.dialog.states.definitions.State.Output.endConversation()
End the conversation immediately.

Return *State.Output* object with appropriate settings

static Output roboy.dialog.states.definitions.State.Output.endConversation(String lastW
End the conversation after saying some last words.

Return *State.Output* object with appropriate settings

Parameters

- `lastWords`: last word to say (something like "I'll be back")

Private Functions

roboy.dialog.states.definitions.State.Output.Output(OutputType type, Interpretation int
Private constructor, used only inside static methods.

Parameters

- `type`: type of this react object
- `interpretation`: optional interpretation object (or null)

Private Members

final Logger roboy.dialog.states.definitions.State.Output.logger = LogManager.getLogger()

final OutputType roboy.dialog.states.definitions.State.Output.type

final Interpretation roboy.dialog.states.definitions.State.Output.interpretation

Segue roboy.dialog.states.definitions.State.Output.segue

String roboy.dialog.states.definitions.State.Output.emotion

interface *roboy*::*io***OutputDevice**
An output device gets a list of actions and should perform those that it can handle.

Subclassed by *roboy.io.BingOutput*, *roboy.io.CerevoiceOutput*, *roboy.io.CommandLineOutput*, *roboy.io.EmotionOutput*, *roboy.io.FreeTTSOutput*, *roboy.io.IBMWatsonOutput*, *roboy.io.MultiOutputDevice*, *roboy.io.TelegramOutput*, *roboy.io.UdpOutput*

Public Functions

void roboy.io.OutputDevice.act(List< Action > actions)

enum *roboy*::*dialog*::*states*::*definitions*::*State*::*Output***OutputType**

Public Members

roboy.dialog.states.definitions.State.Output.OutputType.INTERPRETATION

roboy.dialog.states.definitions.State.Output.OutputType.SAY_NOTHING

roboy.dialog.states.definitions.State.Output.OutputType.USE_FALLBACK

roboy.dialog.states.definitions.State.Output.OutputType.END_CONVERSATION

template <KEY, VALUE>
class *roboy*::*util*::**Pair**

A simple tuple class to store two values.

Like javafx.util.pair just more simple, but accessible from maven.

Parameters

- <KEY>: First value of the tuple
- <VALUE>: Second value of the tuple

Public Functions

roboy.util.Pair< KEY, VALUE >.Pair(KEY key, VALUE value)

KEY roboy.util.Pair< KEY, VALUE >.getKey()

VALUE roboy.util.Pair< KEY, VALUE >.getValue()

Private Members

KEY roboy.util.Pair< KEY, VALUE >.key = null

VALUE roboy.util.Pair< KEY, VALUE >.value = null

enum *roboy*::*linguistics*::*Linguistics*::**ParsingOutcome**

Public Members

roboy.linguistics.Linguistics.ParsingOutcome.SUCCESS

roboy.linguistics.Linguistics.ParsingOutcome.FAILURE

roboy.linguistics.Linguistics.ParsingOutcome.UNDERSPECIFIED

class

Passive state to start a conversation.

Roboy is waiting until a greeting or his name is detected.

Public Functions

roboy.dialog.states.ordinaryStates.PassiveGreetingsState.PassiveGreetingsState(String

Output roboy.dialog.states.ordinaryStates.PassiveGreetingsState.act()

Output roboy.dialog.states.ordinaryStates.PassiveGreetingsState.react(Interpretation i

State roboy.dialog.states.ordinaryStates.PassiveGreetingsState.getNextState()

boolean roboy.dialog.states.ordinaryStates.PassiveGreetingsState.isFallbackRequired()

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.PassiveGreetingsState.getRequiredTransi

Set<String> roboy.dialog.states.ordinaryStates.PassiveGreetingsState.getRequiredParame

Private Members

final String roboy.dialog.states.ordinaryStates.PassiveGreetingsState.TRANSITION_GREET

State roboy.dialog.states.ordinaryStates.PassiveGreetingsState.next

template <Target>
class

An implementation of the UpdatePolicy which performs regular updates on a target object.

The method update() needs to be implemented in the subclass.

Parameters

- `<Target>`: The class of the target object.

Public Functions

roboy.context.PeriodicUpdater< Target >.PeriodicUpdater(Target target)

Create a new updater service, executing the update() method at regular time intervals.

Parameters

- `target`: The target attribute of the update() method.

Public Static Attributes

int roboy.context.PeriodicUpdater< Target >.updateFrequencySeconds = 1

Protected Attributes

final Target roboy.context.PeriodicUpdater< Target >.target

Private Functions

void roboy.context.PeriodicUpdater< Target >.start()

Starts the ScheduledExecutorService of the updating thread.

Private Members

final ScheduledExecutorService roboy.context.PeriodicUpdater< Target >.scheduler = Execut

class

Personal Information Asking State.

The state tries to interact with the Interlocutor to learn new information about the person. This information is sent to the Roboy Memory Module through Neo4jMemoryInterface for storing. Afterwards, Roboy can use this acquired data for the future interactions with the same person.

- if there is no existing Interlocutor or the data is missing, ask a question
- the question topic (intent) is selected from the Neo4jRelationship predicates
- retrieve the questions stored in the QAList json file
- update the Context IntentsHistory
- try to extract the result from the Interpretation
- retrieve the answers stored in the QAList json file
- send the result to Memory

PersonalInformationAskingState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined, following state if the question was asked:

- skills,
- abilities,
- roboy. 3) Required parameters: path to the QAList.json file.

Public Functions

roboy.dialog.states.expoStates.PersonalInformationAskingState.PersonalInformationAskin

Output roboy.dialog.states.expoStates.PersonalInformationAskingState.act()

Output roboy.dialog.states.expoStates.PersonalInformationAskingState.react(Interpretat

State roboy.dialog.states.expoStates.PersonalInformationAskingState.getNextState()

Public Static Attributes

final String roboy.dialog.states.expoStates.PersonalInformationAskingState.INTENTS_HIS

Protected Functions

Set<String> roboy.dialog.states.expoStates.PersonalInformationAskingState.getRequiredT

Set<String> roboy.dialog.states.expoStates.PersonalInformationAskingState.getRequiredP

Private Functions

String roboy.dialog.states.expoStates.PersonalInformationAskingState.InferResult(Interp

Private Members

final String [] roboy.dialog.states.expoStates.PersonalInformationAskingState.TRANSITI

final String [] roboy.dialog.states.expoStates.PersonalInformationAskingState.INTENT_N

final String roboy.dialog.states.expoStates.PersonalInformationAskingState.QA_FILE_PAR

final Logger roboy.dialog.states.expoStates.PersonalInformationAskingState.LOGGER = LogM

QAJsonParser roboy.dialog.states.expoStates.PersonalInformationAskingState.qaValues

Neo4jRelationship [] roboy.dialog.states.expoStates.PersonalInformationAskingState.pre

Neo4jRelationship roboy.dialog.states.expoStates.PersonalInformationAskingState.selecte

int roboy.dialog.states.expoStates.PersonalInformationAskingState.otherIndex

State roboy.dialog.states.expoStates.PersonalInformationAskingState.nextState

class

Personal Information Asking State.

The state tries to interact with the Interlocutor to learn new information about the person. This information is sent to the Roboy Memory Module through Neo4jMemoryInterface for storing. Afterwards, Roboy can use this acquired data for the future interactions with the same person.

- if there is no existing Interlocutor or the data is missing, ask a question
- the question topic (intent) is selected from the Neo4jRelationship predicates
- retrieve the questions stored in the QAList json file
- update the Context IntentsHistory
- try to extract the result from the Interpretation
- retrieve the answers stored in the QAList json file
- send the result to Memory

PersonalInformationAskingState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined:

- TRANSITION_INFO_OBTAINED: following state if the question was asked 3) Required parameters: path to the QAList.json file.

Public Functions

roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.PersonalInformationA

Output roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.act()

Output roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.react(Interpre

State roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.getNextState()

Public Static Attributes

final String roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.INTENTS_

Protected Functions

```
Set<String> roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.getRequi
Set<String> roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.getRequi
```

Package Attributes

```
final Logger roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.LOGGER =
```

Private Functions

```
String roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.InferResult(I
```

Private Members

```
QAJsonParser roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.qaValue
Neo4jRelationship [] roboy.dialog.states.ordinaryStates.PersonalInformationAskingState
Neo4jRelationship roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.se
State roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.nextState
final String roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.TRANSIT
final String roboy.dialog.states.ordinaryStates.PersonalInformationAskingState.QA_FILE
```

class

Personal Information Update State.

This state is only entered if there are some known facts about the active interlocutor. The state tries to interact with the Interlocutor to update the existing information about the person. This information is sent to the Roboy Memory Module through Neo4jMemoryInterface to keep it up to date.

- if there is an existing entry under a specific Neo4jRelationship predicate, select the predicate
- check the Context IntentsHistory if we already asked similar questions
- the question topic (intent) is selected upon the predicate
- update the Context IntentsHistory with the selected predicate
- retrieve the follow-up questions stored in the QAList json file
- retrieve the follow-up answers stored in the QAList json file

PersonalInformationFollowUpState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined:

- TRANSITION_INFO_UPDATED: following state if the question was asked 3) Required parameters: path to the QAList.json file.

Public Functions

roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.PersonalInformatio

Output roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.act()

Output roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.react(Interp

State roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.getNextState

Public Static Attributes

final String roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.INTENT

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.getReq

Set<String> roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.getReq

Private Functions

String roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.InferUpdate

Private Members

QAJsonParser roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.qaVal

Neo4jRelationship [] roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpSta

Neo4jRelationship roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.

State roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.nextState

final String roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.TRANS

final String roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.QA_FI

final Logger roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState.LOGGE

interface *roboy*::*dialog*::*personality***Personality**

Personality interface.

A personality is designed to define how Roboy reacts in every given situation. Roboy can always only represent one personality at a time. Different personalities are meant to be used in different situations, like a more formal or loose one depending on the occasion where he is at. In the future, also different languages could be realized by the use of different personalities.

Subclassed by *roboy.dialog.personality.StateBasedPersonality*

Public Functions

List<Action> roboy.dialog.personality.Personality.answer(Interpretation input)

The central method of a personality.

Given an interpretation of all inputs (audio, visual, ...) to Roboy, this method decides which actions to perform in response.

Return A list of actions to perform in response

Parameters

- `input`: The interpretation of the inputs

interface *roboy*::*linguistics*::*phonetics***PhoneticEncoder**

An interface for phonetic encoders that map words to their phonetic base form so that words that are written differently but sound similar receive the same form.

This is intended to be used to correct terms that Roboy misunderstood, but currently is not is use.

Subclassed by *roboy.linguistics.phonetics.DoubleMetaphoneEncoder*, *roboy.linguistics.phonetics.MetaphoneEncoder*, *roboy.linguistics.phonetics.SoundexEncoder*

Public Functions

String roboy.linguistics.phonetics.PhoneticEncoder.encode(String input)

class *roboy*::*linguistics*::*phonetics***Phonetics**

Public Functions

List<String> roboy.linguistics.phonetics.Phonetics.similarWords(String word)

Public Static Functions

static void roboy.linguistics.phonetics.Phonetics.main(String[] args)

Private Members

Soundex roboy.linguistics.phonetics.Phonetics.soundex = new Soundex()

Map<String,List<String> > roboy.linguistics.phonetics.Phonetics.codecToWords

class *roboy*::*talk***PhraseCollection**

A (temporary) central class to store short lists of phrases.

The lists are stored in separate files. This class loads all of them once at the beginning, so all the lists can be used by any other class later.

We might define a JSON format to replace the single files later.

Public Static Attributes

RandomList<String> roboy.talk.PhraseCollection.CONNECTING_PHRASES = FileLineReader.readFile("res

RandomList<String> roboy.talk.PhraseCollection.QUESTION_ANSWERING_REENTERING = FileLineRea

RandomList<String> roboy.talk.PhraseCollection.QUESTION_ANSWERING_START = FileLineReader.read

RandomList<String> roboy.talk.PhraseCollection.SEGUE_AVOID_ANSWER = FileLineReader.readFile("res

RandomList<String> roboy.talk.PhraseCollection.SEGUE_DISTRACT = FileLineReader.readFile("resources

RandomList<String> roboy.talk.PhraseCollection.SEGUE_FLATTERY = FileLineReader.readFile("resources

RandomList<String> roboy.talk.PhraseCollection.SEGUE_JOBS = FileLineReader.readFile("resources/phras

RandomList<String> roboy.talk.PhraseCollection.SEGUE_PICKUP = FileLineReader.readFile("resources/ph

RandomList<String> roboy.talk.PhraseCollection.PROFANITY_CHECK_WORDS = FileLineReader.readFile(

RandomList<String> roboy.talk.PhraseCollection.FACTS = FileLineReader.readFile("resources/phraseLists/

RandomList<String> roboy.talk.PhraseCollection.INFO_ROBOY_INTENT_PHRASES = FileLineReader.rea

RandomList<String> roboy.talk.PhraseCollection.JOKES = FileLineReader.readFile("resources/phraseLists/

RandomList<String> roboy.talk.PhraseCollection.NEGATIVE_SENTIMENT_PHRASES = FileLineReader.r

RandomList<String> roboy.talk.PhraseCollection.OFFER_FACTS_PHRASES = FileLineReader.readFile("re

RandomList<String> roboy.talk.PhraseCollection.OFFER_FAMOUS_ENTITIES_PHRASES = FileLineRea

RandomList<String> roboy.talk.PhraseCollection.OFFER_JOKES_PHRASES = FileLineReader.readFile("re

RandomList<String> roboy.talk.PhraseCollection.OFFER_MATH_PHRASES = FileLineReader.readFile("res

RandomList<String> roboy.talk.PhraseCollection.PARSER_ERROR = FileLineReader.readFile("resources/ph

class

Corrects abbreviated forms like "I'm" to complete forms like "I am" which are expected by later sentence analyses.

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.Preprocessor.analyze(Interpretation

class

Checks for words and stores if the sentence has profanity in the *Interpretation* Profanity feature that is later read out and fed to the output module.

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.ProfanityAnalyzer.analyze(Interpreta

class *roboy*::*util***QAFileParser**

Parses files containing predefined questions and answers.

Expects the following input pattern: { "INTENT": { "Q": ["Question phrasing 1", "Question phrasing 2", "Question phrasing 3"], "A": { "SUCCESS": ["Possible answer on success 1", "Possible answer on success 2"], "FAILURE": ["Possible answer on failure"] } } }

See more examples in resources/sentences

Public Functions

roboy.util.QAFileParser.QAFileParser(String file)

Map<String, List<String> > roboy.util.QAFileParser.getQuestions()

Map<String, List<String> > roboy.util.QAFileParser.getSuccessAnswers()

Map<String, List<String> > roboy.util.QAFileParser.getFailureAnswers()

Private Members

final Logger roboy.util.QAFileParser.logger = LogManager.getLogger()

Private Static Attributes

Map<String, List<String> > roboy.util.QAFileParser.questions

Map<String, List<String> > roboy.util.QAFileParser.successAnswers

Map<String, List<String> > roboy.util.QAFileParser.failureAnswers

class *roboy*::*util*.**QAJsonParser**

Getting values for personalStates and follow-up questions from a JSON file.

Public Functions

roboy.util.QAJsonParser.QAJsonParser()

roboy.util.QAJsonParser.QAJsonParser(String file)

JsonModel roboy.util.QAJsonParser.parse(String file)

JsonModel roboy.util.QAJsonParser.getQA()

JsonEntryModel roboy.util.QAJsonParser.getEntry(Neo4jRelationship relationship)

JsonEntryModel roboy.util.QAJsonParser.getEntry(Neo4jProperty property)

RandomList<String> roboy.util.QAJsonParser.getQuestions(Neo4jRelationship relationship

Map<String, RandomList<String> > roboy.util.QAJsonParser.getAnswers(Neo4jRelationship

RandomList<String> roboy.util.QAJsonParser.getSuccessAnswers(Neo4jRelationship relatio

RandomList<String> roboy.util.QAJsonParser.getFailureAnswers(Neo4jRelationship relatio

Map<String, RandomList<String> > roboy.util.QAJsonParser.getFollowUp(Neo4jRelationship

RandomList<String> roboy.util.QAJsonParser.getFollowUpQuestions(Neo4jRelationship rela

RandomList<String> roboy.util.QAJsonParser.getFollowUpAnswers(Neo4jRelationship relati

RandomList<String> roboy.util.QAJsonParser.getQuestions(Neo4jProperty property)

Map<String, RandomList<String> > roboy.util.QAJsonParser.getAnswers(Neo4jProperty prop

RandomList<String> roboy.util.QAJsonParser.getSuccessAnswers(Neo4jProperty property)

RandomList<String> roboy.util.QAJsonParser.getFailureAnswers(Neo4jProperty property)

Map<String, RandomList<String> > roboy.util.QAJsonParser.getFollowUp(Neo4jProperty pro

RandomList<String> roboy.util.QAJsonParser.getFollowUpQuestions(Neo4jProperty property

RandomList<String> roboy.util.QAJsonParser.getFollowUpAnswers(Neo4jProperty property)

Private Functions

JsonEntryModel roboy.util.QAJsonParser.getJsonEntryModel(String type)

Private Members

Gson roboy.util.QAJsonParser.gson

JsonModel roboy.util.QAJsonParser.jsonObject

final Logger roboy.util.QAJsonParser.LOGGER = LogManager.getLogger()

class *roboy*::*parser***QAParserTest**

Public Functions

void roboy.parser.QAParserTest.testEntryEquivalency()

void roboy.parser.QAParserTest.testQuestions()

void roboy.parser.QAParserTest.testAnswers()

void roboy.parser.QAParserTest.testFollowUp()

Public Static Functions

static void roboy.parser.QAParserTest.createJsonAndParse()

static void roboy.parser.QAParserTest.cleanUpJson()

Package Static Attributes

QAJsonParser roboy.parser.QAParserTest.parser

String roboy.parser.QAParserTest.path = "test.json"

class

This state will answer generalStates questions.

The parser:

- provides triples generated from the question
- adds the answer to the question if there is an answer in DBpedia
- tells a specifying followup question if the interlocutor's question was ambiguous

This state:

- returns the answer if provided by the parser
- asks the specifying followup question if provided by the parser
- - if answered with yes > will use the parser again to get the answer to the original question
  - if answered with no > will use a segue to avoid answer
- tries to query memory if there is no answer to the question
- queries the fallback if memory fails to answer as well

QuestionAnsweringState interface: 1) Fallback is required. 2) Outgoing transitions that have to be defined:

- finishedQuestionAnswering: following state if this state if finished with answering questions 3) No parameters are used.

Public Functions

roboy.dialog.states.ordinaryStates.QuestionAnsweringState.QuestionAnsweringState(Strin

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.act()

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.react(Interpretation

State roboy.dialog.states.ordinaryStates.QuestionAnsweringState.getNextState()

boolean roboy.dialog.states.ordinaryStates.QuestionAnsweringState.isFallbackRequired()

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.QuestionAnsweringState.getRequiredTrans

Private Functions

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.reactToSpecifyingAnsw
React to answer of the specifying question asked previously.

Return answer to the answer to the original question if specifying question was answered with 'yes'

Parameters

- `input`: something like "yes" or "no"

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.reactToQuestion(Interp

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.useMemoryOrFallback(I

Output roboy.dialog.states.ordinaryStates.QuestionAnsweringState.answerFromMemory(List

String roboy.dialog.states.ordinaryStates.QuestionAnsweringState.inferMemoryAnswer(Lis

boolean roboy.dialog.states.ordinaryStates.QuestionAnsweringState.isIntentsHistoryComp

Private Members

final Logger roboy.dialog.states.ordinaryStates.QuestionAnsweringState.logger = LogManag

int roboy.dialog.states.ordinaryStates.QuestionAnsweringState.questionsAnswered = 0

boolean roboy.dialog.states.ordinaryStates.QuestionAnsweringState.askingSpecifyingQues

String roboy.dialog.states.ordinaryStates.QuestionAnsweringState.answerAfterUnspecifie

Private Static Attributes

final String roboy.dialog.states.ordinaryStates.QuestionAnsweringState.TRANSITION_FINI

final String roboy.dialog.states.ordinaryStates.QuestionAnsweringState.TRANSITION_LOOP

final String roboy.dialog.states.ordinaryStates.QuestionAnsweringState.TRANSITION_LOOP

final int roboy.dialog.states.ordinaryStates.QuestionAnsweringState.MAX_NUM_OF_QUESTIO

final RandomList<String> roboy.dialog.states.ordinaryStates.QuestionAnsweringState.ree

final RandomList<String> roboy.dialog.states.ordinaryStates.QuestionAnsweringState.ans

template <T>
class *roboy*::*util*::**RandomList** : **public** java::*util*::ArrayList<T>

Extension of ArrayList with possibility to get a random element.

Parameters

- <T>: Class of objects in this list

Public Functions

roboy.util.RandomList< T >.RandomList()

Creates an empty ArrayList.

roboy.util.RandomList< T >.RandomList(T... objects)

Creates a list of objects that allows to select one element at random.

To prevent issues with heap pollution, use this constructor to reduce syntactic overhead only: new *RandomList*("a", "b", "c")

Parameters

- objects: objects to put in the list

roboy.util.RandomList< T >.RandomList(List< T > objectList)

Creates list of objects that allows to select one element at random.

Parameters

- objectList: list containing the objects to add to this list

T roboy.util.RandomList< T >.getRandomElement()

Returns a random element from this list.

Return random element from this list

enum *roboy*::*memory*::*nodes*::Interlocutor**RelationshipAvailability**

Public Members

roboy.memory.nodes.Interlocutor.RelationshipAvailability.ALL_AVAILABLE

roboy.memory.nodes.Interlocutor.RelationshipAvailability.SOME_AVAILABLE

roboy.memory.nodes.Interlocutor.RelationshipAvailability.NONE_AVAILABLE

class

Encapsulates a *MemoryNodeModel* and enables dialog states to easily store and retrieve information about *Roboy*.

Public Functions

roboy.memory.nodes.Roboy.Roboy(Neo4jMemoryInterface memory, String name)

Initializer for the *Roboy* node.

roboy.memory.nodes.Roboy.Roboy(Neo4jMemoryInterface memory)

Default initializer for the *Roboy* node.

String roboy.memory.nodes.Roboy.getName()

Method to obtain the name of the *Roboy* node.

Return String name - text containing the name as in the *Memory*

ArrayList<Integer> roboy.memory.nodes.Roboy.getRelationships(Neo4jRelationship relatio

Method to obtain the specific type relationships of the *Roboy* node.

Return ArrayList<Integer> ids - list containing integer IDs of the nodes related to the *Roboy* by specific relationship type as in the *Memory*

void roboy.memory.nodes.Roboy.addInformation(Neo4jRelationship relationship, String na

Adds a new relation to the *Roboy* node, updating memory.

Public Static Attributes

final RandomList<Neo4jRelationship> roboy.memory.nodes.Roboy.VALID_NEO4J_RELATIONSHIPS

Private Functions

void roboy.memory.nodes.Roboy.InitializeRoboy(String name)

This method initializes the roboy property as a node that is in sync with memory and represents the *Roboy* itself.

If something goes wrong during querying, *Roboy* stays empty and soulless, and has to fallback

enum *roboy*::*dialog*::*states*::*expoStates***RoboyAbility**

Implementations of Roboy's abilities.

Following methods have to be implemented:

- *wouldYouLikeToSeeDemoQuestions()* - provides a list of yes/no questions for the act method
- *demonstrateAbility()* - implementation of the ability (should block until demonstration is finished)
- *afterDemoEndedPhrases()* - provides a list of phrases that wrap up the ability demonstration

Public Functions

abstract RandomList<String> roboy.dialog.states.expoStates.RoboyAbility.wouldYouLikeTo

List of phrases for the act method.

Every phrase should ask the interlocutor whether he wants to see the ability in action.

Return list of phrases for the act method

abstract void roboy.dialog.states.expoStates.RoboyAbility.demonstrateAbility(RosMainNo
Implementation of the ability.

This method should block until the ability demonstration is finished.

abstract RandomList<String> roboy.dialog.states.expoStates.RoboyAbility.afterDemoEndedI
List of phrases that wrap up the ability demonstration.

One of these phrases will be used after the demonstration is finished.

Return list of phrases that wrap up the ability demonstration

Public Members

roboy.dialog.states.expoStates.RoboyAbility.wouldYouLikeToSeeDemoQuestions

Private Static Attributes

static final Logger roboy.dialog.states.expoStates.RoboyAbility.logger = LogManager.getLog

enum *roboy*::*emotions***RoboyEmotion**
Comprises the emotions Roboy can demonstrate.

Public Functions

roboy.emotions.RoboyEmotion.RoboyEmotion(String type)

Public Members

roboy.emotions.RoboyEmotion.SHY =("shy")

roboy.emotions.RoboyEmotion.SMILE_BLINK =("smileblink")

roboy.emotions.RoboyEmotion.LOOK_LEFT =("lookleft")

roboy.emotions.RoboyEmotion.LOOK_RIGHT =("lookright")

roboy.emotions.RoboyEmotion.CAT_EYES =("catiris")

roboy.emotions.RoboyEmotion.KISS =("kiss")

roboy.emotions.RoboyEmotion.FACEBOOK_EYES =("img:facebook")

roboy.emotions.RoboyEmotion.NEUTRAL =("neutral")

String roboy.emotions.RoboyEmotion.type

class
Class detecting Roboy name.

Initiates native sphinx function of live speech analysis and checks the stream

Author Petr Romanov

Version 1.0

Date 21.04.2017

Public Functions

roboy.io.RoboyNameDetectionInput.RoboyNameDetectionInput()
constructor which initialises recognition

void roboy.io.RoboyNameDetectionInput.stopListening()
function for correct stopping recognition

Input roboy.io.RoboyNameDetectionInput.listen()
tracks what was said

Return A signal that Roboy is one of the words in just said phrase

Protected Attributes

LiveSpeechRecognizer roboy.io.RoboyNameDetectionInput.recog_copy
'link' to the object of Recognizer for correct stopping before deletion of the RoboyNameDetectorInput object

class
Roboy Question Answering State.

This state will:

- offer the interlocutor to ask a question about Roboy
- retrive the semantic parser result
- try to infer an asked question
- retrive the relevant information from the Roboy node
- compose an answer
- fall back in case of failure

ExpoIntroductionState interface: 1) Fallback is required. 2) Outgoing transitions that have to be defined, following state if the question was answered:

- skills,
- abilities,
- newPerson. 3) Used 'infoFile' parameter containing Roboy answer phrases. Requires a path to RoboyInfoList.json

Public Functions

roboy.dialog.states.expoStates.RoboyQAState.RoboyQAState(String stateIdentifier, State

Output roboy.dialog.states.expoStates.RoboyQAState.act()

Output roboy.dialog.states.expoStates.RoboyQAState.react(Interpretation input)

State roboy.dialog.states.expoStates.RoboyQAState.getNextState()

Public Static Attributes

final String roboy.dialog.states.expoStates.RoboyQAState.INTENTS_HISTORY_ID = "RQA"

Protected Functions

Set<String> roboy.dialog.states.expoStates.RoboyQAState.getRequiredTransitionNames()

Private Functions

String roboy.dialog.states.expoStates.RoboyQAState.inferMemoryAnswer(Interpretation inp

Neo4jRelationship roboy.dialog.states.expoStates.RoboyQAState.inferPredicateFromObject

String roboy.dialog.states.expoStates.RoboyQAState.extractNodeNameForPredicate(Neo4jRe

Private Members

final String [] roboy.dialog.states.expoStates.RoboyQAState.TRANSITION_NAMES = { "skills", "a

final String [] roboy.dialog.states.expoStates.RoboyQAState.INTENT_NAMES = TRANSITION_NA

final String roboy.dialog.states.expoStates.RoboyQAState.INFO_FILE_PARAMETER_ID = "infoFil

final RandomList<String> roboy.dialog.states.expoStates.RoboyQAState.connectingPhrases

final RandomList<String> roboy.dialog.states.expoStates.RoboyQAState.roboyIntentPhrase

final Logger roboy.dialog.states.expoStates.RoboyQAState.LOGGER = LogManager.getLogger()

QAJsonParser roboy.dialog.states.expoStates.RoboyQAState.infoValues

State roboy.dialog.states.expoStates.RoboyQAState.nextState

boolean roboy.dialog.states.expoStates.RoboyQAState.intentIsFriend = false

enum *roboy*::*dialog*::*states*::*expoStates***RoboySkillIntent**

Enum implementation of Roboy's skills.

General functionality:

- getRequestPhrase() - provides a phrase to offer some skills activity
- getResponsePhrase() - provides Roboy's response to the input
- getNegativeSentence() - provides response in case the intent was not POSITIVE

Specific functionality:

- getRandomJoke() - returns a string with a random joke
- getRandomFact() - returns a string with a random fact
- getAnswerFromSemanticParser() - tries to resolve the question with the semantic parser, returns the resulting string on success, uses generative model on failure

Public Functions

roboy.dialog.states.expoStates.RoboySkillIntent.RoboySkillIntent(String type)

String roboy.dialog.states.expoStates.RoboySkillIntent.getRequestPhrase()

String roboy.dialog.states.expoStates.RoboySkillIntent.getResponsePhrase(Interpretatio

Public Members

roboy.dialog.states.expoStates.RoboySkillIntent.jokes =("joke")

roboy.dialog.states.expoStates.RoboySkillIntent.fun_facts =("fact")

roboy.dialog.states.expoStates.RoboySkillIntent.famous_entities =("famous")

roboy.dialog.states.expoStates.RoboySkillIntent.math =("math")

String roboy.dialog.states.expoStates.RoboySkillIntent.type

Private Functions

String roboy.dialog.states.expoStates.RoboySkillIntent.getRandomJoke(Linguistics.Utter

String roboy.dialog.states.expoStates.RoboySkillIntent.getRandomFact(Linguistics.Utter

String roboy.dialog.states.expoStates.RoboySkillIntent.getAnswerFromSemanticParser(Int

String roboy.dialog.states.expoStates.RoboySkillIntent.getNegativeSentence(String name

Private Members

final Logger roboy.dialog.states.expoStates.RoboySkillIntent.LOGGER = LogManager.getLogger()

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.connectingPhr

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.negativePhras

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.offerJokes = Ph

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.offerFacts = Ph

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.offerFamousEn

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.offerMath = Phr

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.jokesList = Phr

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.factsList = Phr

final RandomList<String> roboy.dialog.states.expoStates.RoboySkillIntent.parserError = P

class *roboy*::*ros***Ros**

Communication with ROS.

Public Static Functions

static edu.wpi.rail.jrosbridge.Ros roboy.ros.Ros.getInstance()

static void roboy.ros.Ros.close()

Private Functions

roboy.ros.Ros.Ros()

Private Static Attributes

edu.wpi.rail.jrosbridge.Ros roboy.ros.Ros.ros

final String roboy.ros.Ros.ROS_URL = System.getenv("ROS_IP")

class *roboy*::*ros***RosMainNode** : **public** AbstractNodeMain

Public Functions

roboy.ros.RosMainNode.RosMainNode()

GraphName roboy.ros.RosMainNode.getDefaultNodeName()

void roboy.ros.RosMainNode.onStart(final ConnectedNode connectedNode)

void roboy.ros.RosMainNode.PerformMovement(String bodyPart, String name)

boolean roboy.ros.RosMainNode.SynthesizeSpeech(String text)

String roboy.ros.RosMainNode.RecognizeSpeech()

String roboy.ros.RosMainNode.GenerateAnswer(String question)

boolean roboy.ros.RosMainNode.ShowEmotion(RoboyEmotion emotion)

boolean roboy.ros.RosMainNode.ShowEmotion(String emotion)

String roboy.ros.RosMainNode.CreateMemoryQuery(String query)

String roboy.ros.RosMainNode.UpdateMemoryQuery(String query)

String roboy.ros.RosMainNode.GetMemoryQuery(String query)

String roboy.ros.RosMainNode.DeleteMemoryQuery(String query)

String roboy.ros.RosMainNode.CypherMemoryQuery(String query)

Object roboy.ros.RosMainNode.DetectIntent(String sentence)

void roboy.ros.RosMainNode.addListener(MessageListener listener, RosSubscribers subscr

Protected Attributes

Object roboy.ros.RosMainNode.resp

Package Attributes

String roboy.ros.RosMainNode.warning = "Trying to talk to ROS package %s, but it's not initialized or deactivated"

"status : "FAIL", " + "message : "Memory client not initialized."" + "}"]

final Logger roboy.ros.RosMainNode.LOGGER = LogManager.getLogger()

Private Functions

void roboy.ros.RosMainNode.waitForLatchUnlock(CountDownLatch latch, String latchName)

Helper method to block the calling thread until the latch is zeroed by some other task.

Parameters

- `latch`: Latch to wait for.
- `latchName`: Name to be used in log messages for the given latch.

Private Members

CountDownLatch roboy.ros.RosMainNode.rosConnectionLatch

RosManager roboy.ros.RosMainNode.services = new *RosManager*()

class *roboy*::*ros***RosManager**

Stores all the *Ros* Service Clients and manages access to them.

If SHUTDOWN_ON_ROS_FAILURE is set, throws a runtime exception if any of the clients failed to initialize.

Package Functions

boolean roboy.ros.RosManager.initialize(ConnectedNode node)

Initializes all ServiceClients for *Ros*.

boolean roboy.ros.RosManager.notInitialized(RosServiceClients c)

Should always be called before getService, such that if a client failed to initialize, a fallback response can be created instead.

Important if SHUTDOWN_ON_ROS_FAILURE is false.

boolean roboy.ros.RosManager.notInitialized(RosSubscribers s)

ServiceClient roboy.ros.RosManager.getService(RosServiceClients c)

Returns the ServiceClient matching the *RosServiceClients* entry.

the return might need casting before further use.

Subscriber roboy.ros.RosManager.getSubscriber(RosSubscribers s)

Package Attributes

final Logger roboy.ros.RosManager.LOGGER = LogManager.getLogger()

Private Functions

boolean roboy.ros.RosManager.isAMemoryModule(String client)

Private Members

HashMap<RosServiceClients, ServiceClient> roboy.ros.RosManager.serviceMap

HashMap<RosSubscribers, Subscriber> roboy.ros.RosManager.subscriberMap

enum *roboy*::*ros***RosServiceClients**

Stores the different client addresses and corresponding ROS message types.

Public Functions

roboy.ros.RosServiceClients.RosServiceClients(String rosPackage, String address, Strin

Public Members

roboy.ros.RosServiceClients.SPEECHSYNTHESIS =("roboy_speech_synthesis", "/roboy/cognition/speech/synthesi

roboy.ros.RosServiceClients.GENERATIVE =("roboy_gnlp", "/roboy/cognition/generative_nlp/answer", GenerateA

roboy.ros.RosServiceClients.FACEDETECTION =("roboy_vision", "/speech_synthesis/talk", DetectFace._TYPE)

roboy.ros.RosServiceClients.OBJECTRECOGNITION =("roboy_vision", "/speech_synthesis/talk", RecognizeObjec

roboy.ros.RosServiceClients.STT =("roboy_speech_recognition", "/roboy/cognition/speech/recognition", Recognize

roboy.ros.RosServiceClients.EMOTION =("roboy_face","/roboy/cognition/face/emotion", ShowEmotion._TYPE)

roboy.ros.RosServiceClients.CREATEMEMORY =("roboy_memory", "/roboy/cognition/memory/create", DataQuery.

roboy.ros.RosServiceClients.UPDATEMEMORY =("roboy_memory", "/roboy/cognition/memory/update", DataQuery

roboy.ros.RosServiceClients.GETMEMORY =("roboy_memory", "/roboy/cognition/memory/get", DataQuery._TYPE

roboy.ros.RosServiceClients.DELETEMEMORY =("roboy_memory", "/roboy/cognition/memory/remove", DataQuery

roboy.ros.RosServiceClients.CYPHERMEMORY =("roboy_memory", "/roboy/cognition/memory/cypher", DataQuery

roboy.ros.RosServiceClients.INTENT =("roboy_intents", "/roboy/cognition/detect_intent", DetectIntent._TYPE)

String roboy.ros.RosServiceClients.rosPackage

String roboy.ros.RosServiceClients.address

String roboy.ros.RosServiceClients.type

enum *roboy*::*ros***RosSubscribers**

Public Functions

roboy.ros.RosSubscribers.RosSubscribers(String rosPackage, String address, String type

Public Members

roboy.ros.RosSubscribers.DIRECTION_VECTOR =("roboy_audio", "/roboy/cognition/audio/direction_of_arrival", D

roboy.ros.RosSubscribers.FACE_COORDINATES =("roboy_vision", "/roboy/cognition/vision/coordinates", FaceCoo

roboy.ros.RosSubscribers.NEW_FACIAL_FEATURES =("roboy_vision", "/roboy/cognition/vision/features", NewFac

roboy.ros.RosSubscribers.TEST_TOPIC =("roboy_test", "/roboy", std_msgs.String._TYPE)

String roboy.ros.RosSubscribers.rosPackage

String roboy.ros.RosSubscribers.address

String roboy.ros.RosSubscribers.type

class *roboy*::*context*::*contextObjects***ROSTest** : **public** *roboy*::*context*::ValueHistory<String>

For testing a ROS topic connection which sends simple String messages.

class *roboy*::*context*::*contextObjects*.**ROSTestUpdater** : **public** *roboy*::*context*::ROSTopicUpdater<std_msgs.String, *ROSTest*>
For testing a ROS topic connection which sends simple String messages.

Public Functions

roboy.context.contextObjects.ROSTestUpdater.ROSTestUpdater(ROSTest target, RosMainNode

Protected Functions

RosSubscribers roboy.context.contextObjects.ROSTestUpdater.getTargetSubscriber()

synchronized void roboy.context.contextObjects.ROSTestUpdater.update()

template <Message, Target>
class
An external updater connected to a ROS topic that can push the arriving values to the target.

The update() method should implement the logic of adding to the target.

Parameters

- `<Message>`: Type of messages from the ROS topic.
- `<Target>`: The target object to be updated.

Subclassed by *roboy.context.contextObjects.AudioDirectionUpdater*, *roboy.context.contextObjects.ROSTestUpdater*

Public Functions

roboy.context.ROSTopicUpdater< Message, Target >.ROSTopicUpdater(Target target, RosMai

Protected Functions

abstract RosSubscribers roboy.context.ROSTopicUpdater< Message, Target >.getTargetSubs
Implement this in the subclass to define the ROS subscriber this updater should use.

void roboy.context.ROSTopicUpdater< Message, Target >.addListener(MessageListener list

Protected Attributes

final Target roboy.context.ROSTopicUpdater< Message, Target >.target

volatile Message roboy.context.ROSTopicUpdater< Message, Target >.message

final RosSubscribers roboy.context.ROSTopicUpdater< Message, Target >.targetSubscriber

Private Functions

void roboy.context.ROSTopicUpdater< Message, Target >.start(RosMainNode ros)
Starts a new MessageListener.

class *roboy*::*dialog***Segue**

A segue /swe/ is a smooth transition from one topic to the next.

(c) Wikipedia

Dialog states can decide to add segues to their output (in act() or react()) to improve the dialog flow. Segues are categorized by types and will be inserted into the conversation with a certain probability.

Special options:

- "%s" inside a segue will be replaced with interlocutor's name if available. If no interlocutor is available all segues with "%s" won't be used.

Public Functions

roboy.dialog.Segue.Segue(SegueType type)

Creates a segue based on a type and sets the default appearance probability.

Parameters

- `type`: segue type

roboy.dialog.Segue.Segue(SegueType type, double probability)

Creates a segue based on a type and specified appearance probability.

Note that

Parameters

- `type`: segue type
- `probability`: probability to use this segue in the conversation

SegueType roboy.dialog.Segue.getType()

double roboy.dialog.Segue.getProbability()

Public Static Attributes

final double roboy.dialog.Segue.DEFAULT_PROBABILITY = 0.3

Default segue usage probability.

Private Members

final SegueType roboy.dialog.Segue.type

final double roboy.dialog.Segue.probability

enum *roboy*::*dialog*::*Segue***SegueType**

Definitions of segue types here.

Note: all segues are stored in this class for simplicity and may be moved into a separate file later.

Public Functions

abstract RandomList<String> roboy.dialog.Segue.SegueType.getPossibleSegues()

Returns a list of possible segues for this segue type as strings.

Return list of possible segues

Public Members

roboy.dialog.Segue.SegueType.getPossibleSegues

class
Semantic parser class.

Connects DM to Roboy parser and adds its result to interpretation class.

Public Functions

roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.SemanticParserAnalyzer()
A constructor.

Creates ParserAnalyzer class and connects the parser to DM using a socket.

Interpretation roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.analyze(Interp
An analyzer function.

Sends input sentence to the parser and saves its response in output interpretation.

Return Input interpretation with semantic parser result.

Parameters

- `interpretation`: Input interpretation with currently processed sentence and results from previous analysis.

Public Static Functions

static void roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.main(String[] ar
Testing function.

Private Functions

String roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.get_answers(String ans
Function reading parser answer in returned JSON string.

List can contain triples, strings or doubles.

Return String formed by joined list.

Parameters

- `answer`: String containing parser answer received by analyzer.

List<Triple> roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.extract_relatio
Function reading extracted relations in returned JSON string.

Return List of triple objects with relations extracted.

Parameters

- `relations`: Map of relations and their confidence.

List<Triple> roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.extract_triples
Function reading triples from returned JSON string.

Return List of triple objects with RDF triples extracted.

Parameters

- `input`: parsing result

Private Members

SemanticAnalyzerInterface roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.se

Private Static Attributes

final Logger roboy.linguistics.sentenceanalysis.SemanticParserAnalyzer.logger = LogManag

enum *roboy*::*linguistics*::*Linguistics***SemanticRole**

Public Members

roboy.linguistics.Linguistics.SemanticRole.PREDICATE

roboy.linguistics.Linguistics.SemanticRole.AGENT

roboy.linguistics.Linguistics.SemanticRole.PATIENT

roboy.linguistics.Linguistics.SemanticRole.TIME

roboy.linguistics.Linguistics.SemanticRole.LOCATION

roboy.linguistics.Linguistics.SemanticRole.MANNER

roboy.linguistics.Linguistics.SemanticRole.INSTRUMENT

roboy.linguistics.Linguistics.SemanticRole.ORIGIN

roboy.linguistics.Linguistics.SemanticRole.DESTINATION

roboy.linguistics.Linguistics.SemanticRole.RECIPIENT

roboy.linguistics.Linguistics.SemanticRole.BENEFICIARY

roboy.linguistics.Linguistics.SemanticRole.PURPOSE

roboy.linguistics.Linguistics.SemanticRole.CAUSE

class
Tries to find triples with rather stupid heuristics and stores the results in the Linguistics.TRIPLE attribute of the interpretation.

Public Functions

roboy.linguistics.sentenceanalysis.SentenceAnalyzer.SentenceAnalyzer()

Interpretation roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyze(Interpretat

Private Functions

Interpretation roboy.linguistics.sentenceanalysis.SentenceAnalyzer.extractPAS(String s

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeStatement(List< Stri

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeIsIt(List< String > t

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeDoesIt(List< String

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeWho(List< String > t

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeWhat(List< String > t

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeHowIs(List< String >

Triple roboy.linguistics.sentenceanalysis.SentenceAnalyzer.analyzeHowDo(List< String >

Private Members

Map<String, String> roboy.linguistics.sentenceanalysis.SentenceAnalyzer.meanings

enum *roboy*::*linguistics*::*Linguistics***SentenceType**

Public Members

roboy.linguistics.Linguistics.SentenceType.GREETING

roboy.linguistics.Linguistics.SentenceType.FAREWELL

roboy.linguistics.Linguistics.SentenceType.SEGUE

roboy.linguistics.Linguistics.SentenceType.ANECDOTE

roboy.linguistics.Linguistics.SentenceType.STATEMENT

roboy.linguistics.Linguistics.SentenceType.NONE

roboy.linguistics.Linguistics.SentenceType.WHO

roboy.linguistics.Linguistics.SentenceType.HOW

roboy.linguistics.Linguistics.SentenceType.HOW_IS

roboy.linguistics.Linguistics.SentenceType.HOW_DO

roboy.linguistics.Linguistics.SentenceType.WHY

roboy.linguistics.Linguistics.SentenceType.WHEN

roboy.linguistics.Linguistics.SentenceType.WHERE

roboy.linguistics.Linguistics.SentenceType.WHAT

roboy.linguistics.Linguistics.SentenceType.IS_IT

roboy.linguistics.Linguistics.SentenceType.DOES_IT

class

Tokenizes the text by splitting at whitespace and stores the resulting tokens in the Linguistics.TOKENS attribute of the interpretation.

Public Functions

Interpretation roboy.linguistics.sentenceanalysis.SimpleTokenizer.analyze(Interpretati

Private Functions

List<String> roboy.linguistics.sentenceanalysis.SimpleTokenizer.tokenize(String senten

class
A phonetic encoder using the method soundex that maps words to their phonetic base form so that words that are written differently but sound similar receive the same form.

This is intended to be used to correct terms that Roboy misunderstood, but currently is not is use.

Public Functions

roboy.linguistics.phonetics.SoundexEncoder.SoundexEncoder(Soundex soundex)

String roboy.linguistics.phonetics.SoundexEncoder.encode(String input)

Private Members

Soundex roboy.linguistics.phonetics.SoundexEncoder.soundex

class
Action used for talking.

Public Functions

roboy.dialog.action.SpeechAction.SpeechAction(String text)
Constructor.

Parameters

- `text`: The text Roboy will utter

String roboy.dialog.action.SpeechAction.getText()

Private Members

String roboy.dialog.action.SpeechAction.text

class *roboy*::*dialog*::*states*::*definitions***State**
Central class of the dialog state system.

Every dialog state should extend this class. A state always acts when it is entered and reacts when its left. Both, the reaction of the last and the action of the next state, are combined to give the answer of Roboy.

A state can have any number of transitions to other states. Every transition has a name (like "next" or "errorState"). When designing a new state, only the transition names are known. At run time the transitions will point to other states. You can get the attached state by the transition name using getTransition(transitionName).

A fallback can be attached to a state. In the case this state doesn't know how to react to an utterance, it can return *Output.useFallback()* from the *react()* function. The state machine will query the fallback in this case. More

details on the fallback concept can be found in the description of the StateBasedPersonality and in comments below.

Subclassed by *roboy.dialog.states.botboy.BotBoyState*, *roboy.dialog.states.definitions.ExpoState*, *roboy.dialog.states.eventStates.UzupisState*, *roboy.dialog.states.expoStates.DemonstrateAbilitiesState*, *roboy.dialog.states.ordinaryStates.FarewellState*, *roboy.dialog.states.ordinaryStates.IntroductionState*, *roboy.dialog.states.ordinaryStates.PassiveGreetingsState*, *roboy.dialog.states.ordinaryStates.PersonalInformationAskingState*, *roboy.dialog.states.ordinaryStates.PersonalInformationFollowUpState*, *roboy.dialog.states.ordinaryStates.QuestionAnsweringSta*
roboy.dialog.states.ordinaryStates.WildTalkState, *roboy.dialog.tutorials.tutorialStates.DoYouKnowMathState*, *roboy.dialog.tutorials.tutorialStates.ToyFarewellState*, *roboy.dialog.tutorials.tutorialStates.ToyGreetingsState*, *roboy.dialog.tutorials.tutorialStates.ToyIntroState*, *roboy.dialog.tutorials.tutorialStates.ToyRandomAnswerState*

Public Functions

roboy.dialog.states.definitions.State.State(String stateIdentifier, StateParameters pa
Create a state object with given identifier (state name) and parameters.

The parameters should contain a reference to a state machine for later use. The state will not automatically add itself to the state machine.

Parameters

- `stateIdentifier`: identifier (name) of this state
- `params`: parameters for this state, should contain a reference to a state machine

String roboy.dialog.states.definitions.State.getIdentifier()

void roboy.dialog.states.definitions.State.setIdentifier(String stateIdentifier)

StateParameters roboy.dialog.states.definitions.State.getParameters()

final State roboy.dialog.states.definitions.State.getFallback()
If this state can't react to the input, the Personality state machine will ask the fallback state to react to the input.

This state still remains active.

Return fallback state

final void roboy.dialog.states.definitions.State.setFallback(State fallback)
Set the fallback state.

The Personality state machine will ask the fallback state if this one has no answer.

Parameters

- `fallback`: fallback state

final void roboy.dialog.states.definitions.State.setTransition(String name, State goTo
Define a possible transition from this state to another.

Something like: "next" -> {GreetingState} "rudeInput" -> {EvilState} The next active state will be selected in *getNextState()* based on internal conditions.

Parameters

- `name`: name of the transition
- `goToState`: state to transit to

final State roboy.dialog.states.definitions.State.getTransition(String name)

final HashMap<String, State> roboy.dialog.states.definitions.State.getAllTransitions()

final void roboy.dialog.states.definitions.State.setOptionalPersFileInfo(String key, S
Set personality file additional information like state comment.

[!!] Do not use it in your state code! This info is only stored to make sure we don't lose the comment etc. when saving this state to file.

final String roboy.dialog.states.definitions.State.getOptionalPersFileInfo(String key)
Get personality file additional information like state comment.

[!!] Do not use it in your state code! This info is only stored to make sure we don't lose the comment etc. when saving this state to file.

abstract Output roboy.dialog.states.definitions.State.act()
A state always acts after the reaction.

Both, the reaction of the last and the action of the next state, are combined to give the answer of Roboy.

Return interpretations

abstract Output roboy.dialog.states.definitions.State.react(Interpretation input)
Defines how to react to an input.

This is usually the answer to the incoming question or some other statement. If this state can't react, it can return 'null' to trigger the fallback state for the answer.

Note: In the new architecture, *react()* does not define the next state anymore! Reaction and state transitions are now decoupled. *State* transitions are defined in *getNextState()*

Return reaction to the input (should not be null)

Parameters

- `input`: input from the person we talk to

abstract State roboy.dialog.states.definitions.State.getNextState()
After this state has reacted, the personality state machine will ask this state to which state to go next.

If this state is not ready, it will return itself. Otherwise, depending on internal conditions, this state will select one of the states defined in transitions to be the next one.

Return next active state after this one has reacted

boolean roboy.dialog.states.definitions.State.isFallbackRequired()
This function can be overridden to sub classes to indicate that this state can require a fallback.

If this is the case, but no fallback was defined, you will be warned.

Return true if this state requires a fallback and false otherwise

final boolean roboy.dialog.states.definitions.State.allRequiredTransitionsAreInitializ
Checks if all required transitions were initialized correctly.

Required transitions are defined in *getRequiredTransitionNames()*.

Return true if all required transitions of this state were initialized correctly

final boolean roboy.dialog.states.definitions.State.allRequiredParametersAreInitialize
Checks if all required parameters were initialized correctly.

Required parameters are defined in getRequiredParameterNames().

Return true if all required parameters of this state were initialized correctly

JsonObject roboy.dialog.states.definitions.State.toJsonObject()
Create a JSON representation for this state.

Only the identifier, class name, transitions, parameters and fallback identifier are saved. Internal other internal variables are ignored.

Return JSON representation for this state

String roboy.dialog.states.definitions.State.toString()

boolean roboy.dialog.states.definitions.State.equals(Object obj)

Protected Functions

Set<String> roboy.dialog.states.definitions.State.getRequiredTransitionNames()
Defines the names of all transition that HAVE to be defined for this state.

This function is used by *allRequiredTransitionsAreInitialized()* to make sure this state was initialized correctly. Default implementation requires no transitions to be defined.

Override this function in sub classes.

Return a set of transition names that have to be defined

Set<String> roboy.dialog.states.definitions.State.getRequiredParameterNames()

Set<String> roboy.dialog.states.definitions.State.newSet(String... tNames)
Utility function to create and initialize string sets in just one code line.

Return set initialized with inputs

Parameters

- `tNames`: names of the required transitions

DialogStateMachine roboy.dialog.states.definitions.State.getStateMachine()
Shortcut for getParameters().*getStateMachine()*

Return *DialogStateMachine*

RosMainNode roboy.dialog.states.definitions.State.getRosMainNode()
Shortcut for getParameters().*getRosMainNode()*

Return RosMainNode (if previously provided to the *DialogStateMachine*)

Neo4jMemoryInterface roboy.dialog.states.definitions.State.getMemory()
Shortcut for getParameters().*getMemory()*

Return Neo4jMemoryInterface (if previously provided to the *DialogStateMachine*)

InferenceEngine roboy.dialog.states.definitions.State.getInference()
Shortcut for getParameters().*getInference()*

Return InferenceEngine

Context roboy.dialog.states.definitions.State.getContext()
Shortcut for getParameters().*getStateMachine()*.*getContext()*

Return Context

RandomList<MemoryNodeModel> roboy.dialog.states.definitions.State.getMemNodesByIds(Arr
Helper function Ask memory to return nodes for given ids.

Return Collection of MemoryNodeModels

Parameters

- `ids`: ids for memory

Private Functions

boolean roboy.dialog.states.definitions.State.equalsHelper_compareTransitions(State ot
check if every transition of this is present in the other and points to the same ID

Return true if all transitions of this state are present in the other state

Parameters

- `other`: other state to compare transitions

Private Members

final Logger roboy.dialog.states.definitions.State.logger = LogManager.getLogger()

String roboy.dialog.states.definitions.State.stateIdentifier

StateParameters roboy.dialog.states.definitions.State.parameters

State roboy.dialog.states.definitions.State.fallback

HashMap<String, State> roboy.dialog.states.definitions.State.transitions

HashMap<String, String> roboy.dialog.states.definitions.State.optionalPersFileInfo
Personality file additional information: everything like state comment goes here.

[!!] Do not use it in your state code! This info is only stored to make sure we don't lose the comment etc. when saving this state to file.

class
Implementation of *Personality* based on a *DialogStateMachine*.

In contrast to previous *Personality* implementations, this one is more generic as it loads the dialog from a file. Additionally, it is still possible to define the dialog structure directly from code (as it was done in previous implementations).

Instead of using nested states that will pass an utterance to each other if a state cannot give an appropriate reaction, we use a fallback concept. If a state doesn't know how to react, it simply doesn't react at all. If a fallback (with is another state) is attached to it, the personality will pass the utterance to the fallback automatically. This concept helps to decouple the states and reduce the dependencies between them.

Public Functions

roboy.dialog.personality.StateBasedPersonality.StateBasedPersonality(InferenceEngine i

void roboy.dialog.personality.StateBasedPersonality.reset()
Reset this state machine: active state will be set to initial state.

All State objects will stay as they are and will KEEP all internal variables unchanged.

If you do not want to keep any information from the previous conversation, call *loadFromFile()* before reset. Reloading from file will create "fresh" State objects.

boolean roboy.dialog.personality.StateBasedPersonality.conversationEnded()
Indicates that the conversation should stop.

This happens if

- the active state returns no next state
- or the active state returns END_CONVERSATION from act() or react()

Return true if the conversation is finished and this personality should be reset or reloaded from file.

List<Action> roboy.dialog.personality.StateBasedPersonality.startConversation()
Always called once by the (new) *DialogSystem* at the beginning of every new conversation.

Return list of actions based on act() of the initial/active state

List<Action> roboy.dialog.personality.StateBasedPersonality.answer(Interpretation input
The central method of a personality.

Given an interpretation of all inputs (audio, visual, ...) to Roboy, this method decides which actions to perform in response.

Return A list of actions to perform in response

Parameters

- `input`: The interpretation of the inputs

Private Functions

void roboy.dialog.personality.StateBasedPersonality.endConversation()
Internal function, cleanup before the conversation ends:

- set active state to null
- set stopTalking flag to true

void roboy.dialog.personality.StateBasedPersonality.stateAct(State state, List< Actio
Call the act function of the state, verbalize the interpretation (if any) and add it to the list of actions.

Parameters

- `state`: state to call ACT on
- `previousActions`: list of previous action to append the verbalized result

void roboy.dialog.personality.StateBasedPersonality.stateReact(State state, Interpreta
Call the react function of the state.

If the state can't react, recursively ask fallbacks. Verbalize the resulting reaction and add it to the list of actions.

Parameters

- `state`: state to call REact on
- `input`: input from the person Roboy speaks to
- `previousActions`: list of previous action to append the verbalized result

void roboy.dialog.personality.StateBasedPersonality.segueHandler(List< Action > prev
Decide whether to use segue or not and append it to the end of the list of previous actions.

Parameters

- `previousActions`: list of previous actions
- `segue`: segue object

void roboy.dialog.personality.StateBasedPersonality.exceptionHandler(State state, Excep
Internal function, handles exceptions coming from act() or react(...) functions.

In general, act() and react(...) should never throw an exception unless the implementation is buggy. In that case the dialog system will log the error and try to continue working.

Parameters

- `state`: state that threw the exception
- `e`: exception
- `previousActions`: list of previous planned actions, will be extended
- `comesFromAct`: indicates whether act() or react(...) threw the exception

Private Members

final Logger roboy.dialog.personality.StateBasedPersonality.logger = LogManager.getLogger()

final Verbalizer roboy.dialog.personality.StateBasedPersonality.verbalizer

boolean roboy.dialog.personality.StateBasedPersonality.stopTalking

class *roboy*::*dialog*::*states*::*definitions***StateFactory**
This class is used to create *State* objects based on the class name (as a string).

Use case: The personality file defines an implementation for each state. The implementation is a simple string that contains the class name.

Example: Using some magic, this class would convert a string into a proper Java object: roboy.dialog...ToyGreetingsState" > {Java object of class ToyGreetingsState}

Important note for the state implementation: The magic that is used here is called Java Reflection. It adds some small restriction to the implementation of the states: Every *State* sub-class must have a constructor that takes exactly two parameters. The first one is a String, the second is an object of type *StateParameters*. For example: ToyGreetingsState(String id, StateParameters params)

You can have other constructors as well.

Public Static Functions

static State roboy.dialog.states.definitions.StateFactory.createStateByClassName(Strin
Create a Java *State* object based on the provided class name.

Full class name must be used: 'my.package.asdf.StateName' instead of 'StateName'. The class must be a sub-class of *State*.

This function doesn't throw Exceptions and will return null if something goes wrong.

Return a new instance of a *State* object of specified class OR null if something goes wrong

Parameters

- `className`: class name of the *State* object to be created
- `stateIdentifier`: state identifier/name (this is NOT the class name!)
- `parameters`: state parameters

Private Static Attributes

final Logger roboy.dialog.states.definitions.StateFactory.logger = LogManager.getLogger()

class *roboy*::*dialog***StateFactoryTest**
Tests related to the StateFactory.

Public Functions

void roboy.dialog.StateFactoryTest.factoryCreatesCorrectStateObjects()

void roboy.dialog.StateFactoryTest.factoryDoesNotBreakOnInvalidClassNames()

class *roboy*::*dialog***StateMachineEqualityTest**
Tests related to state machine equality.

Public Functions

void roboy.dialog.StateMachineEqualityTest.machineEqualsItself()

void roboy.dialog.StateMachineEqualityTest.stringEqualsCode()

void roboy.dialog.StateMachineEqualityTest.notEqualsNoInitialState()

void roboy.dialog.StateMachineEqualityTest.notEqualsDifferentStates()

void roboy.dialog.StateMachineEqualityTest.notEqualsDifferentTransitions()

class *roboy*::*dialog*::*tutorials***StateMachineExamples**
This class provides examples how to load state machines from files or create them from code directly.

Public Static Functions

static void roboy.dialog.tutorials.StateMachineExamples.main(String[] args)

Private Static Functions

static DialogStateMachine roboy.dialog.tutorials.StateMachineExamples.fromCode()

static DialogStateMachine roboy.dialog.tutorials.StateMachineExamples.fromFile()

static DialogStateMachine roboy.dialog.tutorials.StateMachineExamples.fromString()

Private Static Attributes

final String roboy.dialog.tutorials.StateMachineExamples.toyPersonality

class *roboy*::*dialog***StateMachineInitializationTest**
Tests related to the state machine initialization and loading from file/string.

Public Functions

void roboy.dialog.StateMachineInitializationTest.activeStateIsSetToInitialState()

void roboy.dialog.StateMachineInitializationTest.machineContainsAllStates()

void roboy.dialog.StateMachineInitializationTest.transitionsAreOK()

void roboy.dialog.StateMachineInitializationTest.parametersAreOK()

void roboy.dialog.StateMachineInitializationTest.fallbackIsOK()

class *roboy*::*talk***StatementBuilder**

Public Static Functions

static String roboy.talk.StatementBuilder.random(List< String > list)
Returns a random element from the given list of Strings.

Return

Parameters

- `list`:

class *roboy*::*logic***StatementInterpreter**

Public Static Functions

static boolean roboy.logic.StatementInterpreter.isFromList(String input, List< String
Checks if the given String contains one of the Strings from the given list.

Return

Parameters

- `input`:
- `list`:

class *roboy*::*dialog*::*states*::*definitions***StateParameters**
An object containing all parameters that can be interesting for an arbitrary *State* object.

String parameters are defined in the personality file. Other important parameters are references to the *DialogStateMachine* and the RosMainNode.

Public Functions

roboy.dialog.states.definitions.StateParameters.StateParameters(DialogStateMachine sta

roboy.dialog.states.definitions.StateParameters.StateParameters(DialogStateMachine sta

StateParameters roboy.dialog.states.definitions.StateParameters.setParameter(String pa

String roboy.dialog.states.definitions.StateParameters.getParameter(String parameterNa

HashMap<String, String> roboy.dialog.states.definitions.StateParameters.getAllParamete

DialogStateMachine roboy.dialog.states.definitions.StateParameters.getStateMachine()

RosMainNode roboy.dialog.states.definitions.StateParameters.getRosMainNode()

Neo4jMemoryInterface roboy.dialog.states.definitions.StateParameters.getMemory()

InferenceEngine roboy.dialog.states.definitions.StateParameters.getInference()

Private Members

final Logger roboy.dialog.states.definitions.StateParameters.logger = LogManager.getLogger()

final HashMap<String, String> roboy.dialog.states.definitions.StateParameters.paramNam

final DialogStateMachine roboy.dialog.states.definitions.StateParameters.stateMachine

final RosMainNode roboy.dialog.states.definitions.StateParameters.rosMainNode

final Neo4jMemoryInterface roboy.dialog.states.definitions.StateParameters.memory

final InferenceEngine roboy.dialog.states.definitions.StateParameters.inference

class
Singleton Class For Telegram Bot.

Public Functions

void roboy.util.TelegramCommunicationHandler.onUpdateReceived(Update update)
Receives the updates from telegram's api and called by it.

Parameters

- `update`: consist of an update of a chat.

void roboy.util.TelegramCommunicationHandler.onTimeout(String chatID)
Called when specified time passed w.r.t.

unique chatID. Concatenate all the messages that is not processed. Calls the InputDevice for telegram

Parameters

- `chatID`: unique identifier for a chat.

void roboy.util.TelegramCommunicationHandler.sendMessage(String message, String chatID
Called from the OutputDevice when a message desired to send Initiates the "typing status" and waits for a specified time Sends the message afterwards.

Parameters

- `chatID`: unique identifier for a chat.

void roboy.util.TelegramCommunicationHandler.sendSticker(String chatID, String sticker
Called from the OutputDevice when a message desired to send with stickers Directly sends the sticker, without waiting for a specified time!

Parameters

- `chatID`: unique identifier for a chat.
- `stickerId`: unique identifier for a sticker.

void roboy.util.TelegramCommunicationHandler.sendTypingFromChatID(String chatID)
Sends the "typing" status to the telegram chat.

Parameters

- `chatID`: unique identifier for a chat.

void roboy.util.TelegramCommunicationHandler.sendImageFromUrl(String url, String chatI
Sends a image from url to the desired chat.

Parameters

- `url`: image's url
- `chatId`: unique identifier for a chat

void roboy.util.TelegramCommunicationHandler.sendImageFromFileId(String fileId, String
Sends a image from fileId to the desired chat.

Parameters

- `fileId`: a file id that is produced by telegram and using by it
- `chatId`: unique identifier for a chat

void roboy.util.TelegramCommunicationHandler.sendImageUploadingAFile(String filePath,
Sends a file to the desired chat.

Parameters

- `filePath`: path of a file
- `chatId`: unique identifier for a chat

String roboy.util.TelegramCommunicationHandler.getBotUsername()

String roboy.util.TelegramCommunicationHandler.getBotToken()

Public Static Functions

static TelegramCommunicationHandler roboy.util.TelegramCommunicationHandler.getInstanc

Private Functions

roboy.util.TelegramCommunicationHandler.TelegramCommunicationHandler()

void roboy.util.TelegramCommunicationHandler.handleTimeout(String chatID)
Waits until specified time passed after the last message w.r.t.

given chatId.

Parameters

- `chatID`: unique identifier for a chat.

String roboy.util.TelegramCommunicationHandler.getJsonString(String key)

Private Members

volatile List<Pair<String, String> > roboy.util.TelegramCommunicationHandler.pairs = new

List<Timeout> roboy.util.TelegramCommunicationHandler.telegramTimeouts

Private Static Attributes

final Logger roboy.util.TelegramCommunicationHandler.logger = LogManager.getLogger()

final String roboy.util.TelegramCommunicationHandler.tokensPath = ConfigManager.TELEGRAM_A

final int roboy.util.TelegramCommunicationHandler.TYPING_TIME_LIMIT = 3

final int roboy.util.TelegramCommunicationHandler.INPUT_TIME_LIMIT = 5

final int roboy.util.TelegramCommunicationHandler.initTime = (int) (System.currentTimeMillis() / 100

TelegramCommunicationHandler roboy.util.TelegramCommunicationHandler.instance

class

Handles telegram API and hands threads their respective messages.

Public Functions

roboy.io.TelegramInput.TelegramInput(String uuid)

Creates a Telegraminput device that sorts incoming messages from the telegram handle to the individual conversations.

Parameters

- `uuid`: The uuid of the interlocutor must be formed like this: "telegram-[uuid from service]"

Input roboy.io.TelegramInput.listen()

Thread waits in *listen()* until a new input is provided and the thread is interrupted, then returns with said input.

If the thread is interrupted without *Input* waiting to be consumed, *listen()* throws an IOException

Exceptions

- `InterruptedException`: InterruptedException thrown by the thread when interrupted while wait()ing

void roboy.io.TelegramInput.cleanup()

Deregisters the instance from the static ledger.

Must be called when it should be destroyed or it will stay in memory until the end of operation.

Public Static Functions

static void roboy.io.TelegramInput.onUpdate(Pair < String, String > update)
Gets called by the TelegramAPI Thread whenever a new telegram message arrives.

Places them in the appropriate thread's message string. Creates thread beforehand, if necessary.

Parameters

- `update`: contains a (sender uuid,message) string pair.

Private Members

volatile String roboy.io.TelegramInput.message

Private Static Attributes

final Logger roboy.io.TelegramInput.logger = LogManager.getLogger()

final HashMap<String, TelegramInput> roboy.io.TelegramInput.inputDevices = new HashMap<>()

class

Public Functions

roboy.io.TelegramOutput.TelegramOutput(String uuid)
Handles sending messages to the TelegramAPI from the DialogSystem.

Parameters

- `uuid`: The uuid of the interlocutor must be formed like this: "telegram-[uuid from service]"

void roboy.io.TelegramOutput.act(List< Action > actions)
Carries out actions in the telegram way: Speechactions are sent as text messages via telegram, Emotion-Actions are sent as stickers via telegram.

Parameters

- `actions`: Actions to be carried out on the telegram service

Private Members

TelegramCommunicationHandler roboy.io.TelegramOutput.communicationHandler = TelegramCommu

String roboy.io.TelegramOutput.uuid

Private Static Attributes

final Logger roboy.io.TelegramOutput.logger = LogManager.getLogger()

class *roboy*::*linguistics***Term**

Public Functions

List<String> roboy.linguistics.Term.getPos()

void roboy.linguistics.Term.setPos(List< String > pos)

float roboy.linguistics.Term.getProbability()

void roboy.linguistics.Term.setProbability(float prob)

String roboy.linguistics.Term.getConcept()

void roboy.linguistics.Term.setConcept(String concept)

String roboy.linguistics.Term.toString()

boolean roboy.linguistics.Term.equals(Object obj)

int roboy.linguistics.Term.hashCode()

Private Members

List<String> roboy.linguistics.Term.pos = null

float roboy.linguistics.Term.probability = 0

String roboy.linguistics.Term.concept = null

class *roboy*::*util*::**Timeout**

Public Functions

roboy.util.Timeout.Timeout(long millis)

void roboy.util.Timeout.setMillis(long millis)

long roboy.util.Timeout.getMillis()

String roboy.util.Timeout.getUnique()

void roboy.util.Timeout.setUnique(String unique)

void roboy.util.Timeout.start(TimeoutObserver timeoutObserver)

void roboy.util.Timeout.stop()

Private Members

Runnable roboy.util.Timeout.runnable

long roboy.util.Timeout.millis

Timer roboy.util.Timeout.timer

TimerTask roboy.util.Timeout.timerTask

String roboy.util.Timeout.unique

interface *roboy*::*util*::*Timeout*::**TimeoutObserver**

Subclassed by *roboy.util.TelegramCommunicationHandler*

Public Functions

void roboy.util.Timeout.TimeoutObserver.onTimeout(String unique)

template <V>
class

Sample implementation of a *ValueHistory* using timestamps (longs) as keys and a TreeMap for data storage.

The timestamps are equal or larger than the time when *updateValue()* was called. Implementation does not guarantee perfect timestamp accuracy, but achieves key uniqueness.

Public Functions

roboy.context.TimestampedValueHistory< V >.TimestampedValueHistory()

synchronized V roboy.context.TimestampedValueHistory< V >.getValue() **Return**
The last element added to this history, or `null` if not found.

synchronized TreeMap<Long, V> roboy.context.TimestampedValueHistory< V >.getLastNValue
Get a copy of the last n entries added to the history.

Less values may be returned if there are not enough values in this history. In case of no values, an empty map is returned.

Needs to be synchronized because data cannot be changed while working with an Iterator.

synchronized void roboy.context.TimestampedValueHistory< V >.updateValue(V value)
Puts a value into the history in the last place.

int roboy.context.TimestampedValueHistory< V >.getNumberOfValuesSinceStart()

synchronized boolean roboy.context.TimestampedValueHistory< V >.contains(V value)

synchronized boolean roboy.context.TimestampedValueHistory< V >.purgeHistory()

Private Functions

synchronized long roboy.context.TimestampedValueHistory< V >.generateKey()

Private Members

volatile long roboy.context.TimestampedValueHistory< V >.lastTime
Marks the last time a value was added to the history (or initialization).

TreeMap<Long, V> roboy.context.TimestampedValueHistory< V >.data

int roboy.context.TimestampedValueHistory< V >.totalValuesAdded

class *roboy*::*linguistics*::*word2vec*::*examples***ToyDataGetter**
Utility class to load toy data from the internet if necessary.

May be refactored into something bigger and more useful later.

Public Functions

roboy.linguistics.word2vec.examples.ToyDataGetter.ToyDataGetter(boolean verbose)

String roboy.linguistics.word2vec.examples.ToyDataGetter.getToyDataFilePath()

void roboy.linguistics.word2vec.examples.ToyDataGetter.ensureToyDataIsPresent()
Checks if toy data is present on the hard drive.

It will be downloaded if necessary.

Private Functions

void roboy.linguistics.word2vec.examples.ToyDataGetter.downloadData(String fromURL, St

boolean roboy.linguistics.word2vec.examples.ToyDataGetter.fileExists(String filePath)

Private Members

final boolean roboy.linguistics.word2vec.examples.ToyDataGetter.verbose

final String roboy.linguistics.word2vec.examples.ToyDataGetter.toyDataDirectory = "./resou

final String roboy.linguistics.word2vec.examples.ToyDataGetter.toyDataFilePath = "./resourc

final String roboy.linguistics.word2vec.examples.ToyDataGetter.toyDataInetURL = "https://raw

class
ToyFarewellState always acts with "Bye bye" to indicate the end of conversation.

The interlocutor's answer is ignored and there is no reaction (*Output.sayNothing()*). This ends the conversation (returning null in getNextState()).

ToyFarewellState interface: 1) Fallback is not required. 2) This state has no outgoing transitions. 3) No parameters are used.

Public Functions

roboy.dialog.tutorials.tutorialStates.ToyFarewellState.ToyFarewellState(String stateId

Output roboy.dialog.tutorials.tutorialStates.ToyFarewellState.act()

Output roboy.dialog.tutorials.tutorialStates.ToyFarewellState.react(Interpretation inp

State roboy.dialog.tutorials.tutorialStates.ToyFarewellState.getNextState()

class
This is a very simple example how you could implement an initial state.

Roboy will greet the interlocutor (the guy he speaks to) with "Hello".

If the response is a greeting, the "next" transition is taken. Otherwise the fallback will be triggered and the "noHello" transition is taken.

ToyGreetingsState interface: 1) Fallback is required. 2) Outgoing transitions that have to be defined:

- next: following state if there was a greeting
- noHello: following state if there was NO greeting 3) No parameters are used.

Public Functions

```
roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.ToyGreetingsState(String state
Output roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.act()
Output roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.react(Interpretation in
State roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.getNextState()
boolean roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.isFallbackRequired()
```

Protected Functions

```
Set<String> roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.getRequiredTransit
```

Private Members

```
State roboy.dialog.tutorials.tutorialStates.ToyGreetingsState.next
```

class

ToyIntroState demonstrates a simple introduction.

A single parameter is used. Roboy will tell the interlocutor his name and ask for the Interlocutor's name. The reply is ignored to keep this example simple.

ToyIntroState interface: 1) Fallback is not required. 2) Outgoing transitions that have to be defined:

- next: following state 3) Names of the parameters that have to be passed to the constructor:
- introductionSentence: A sentence that should be used as introduction

Public Functions

```
roboy.dialog.tutorials.tutorialStates.ToyIntroState.ToyIntroState(String stateIdentifi
Output roboy.dialog.tutorials.tutorialStates.ToyIntroState.act()
Output roboy.dialog.tutorials.tutorialStates.ToyIntroState.react(Interpretation input)
State roboy.dialog.tutorials.tutorialStates.ToyIntroState.getNextState()
```

Protected Functions

```
Set<String> roboy.dialog.tutorials.tutorialStates.ToyIntroState.getRequiredTransitionNa
Set<String> roboy.dialog.tutorials.tutorialStates.ToyIntroState.getRequiredParameterNa
```

class

This state is meant to be used as a fallback-only state.

It only implements the react() function returning a hardcoded random answer. The react function of this state will be used if another state can't react and requires a fallback.

This state should never become active (meaning that no transition should point to it.)

ToyRandomAnswerState interface: 1) Fallback is not required (this state should be the fallback). 2) This state has no outgoing transitions. 3) No parameters are used.

Public Functions

`roboy.dialog.tutorials.tutorialStates.ToyRandomAnswerState.ToyRandomAnswerState(String`

`Output roboy.dialog.tutorials.tutorialStates.ToyRandomAnswerState.act()`

`Output roboy.dialog.tutorials.tutorialStates.ToyRandomAnswerState.react(Interpretation`

`State roboy.dialog.tutorials.tutorialStates.ToyRandomAnswerState.getNextState()`

class *roboy*::*linguistics***Triple**

Represents a simple who(subject) does what(predicate) to whom(object) relation.

Public Functions

`roboy.linguistics.Triple.Triple(String subject, String predicate, String object)`

`String roboy.linguistics.Triple.toString()`

`boolean roboy.linguistics.Triple.equals(Object obj)`

`int roboy.linguistics.Triple.hashCode()`

Public Members

`String roboy.linguistics.Triple.subject`

`String roboy.linguistics.Triple.predicate`

`String roboy.linguistics.Triple.object`

class

Created by roboy on 7/27/17.

Public Functions

`roboy.io.UdpInput.UdpInput(DatagramSocket ds)`

`Input roboy.io.UdpInput.listen()`

Private Members

`DatagramSocket roboy.io.UdpInput.serverSocket`

class

Created by roboy on 7/27/17.

Public Functions

`roboy.io.UdpOutput.UdpOutput(DatagramSocket ds, String address, int port)`

`void roboy.io.UdpOutput.act(List< Action > actions)`

Private Members

DatagramSocket roboy.io.UdpOutput.serverSocket

InetAddress roboy.io.UdpOutput.udpEndpointAddress

int roboy.io.UdpOutput.updEndpointPort

class *roboy*::*memory***Util** : **public** Exception

Helper class.

Public Static Functions

static String roboy.memory.Util.getPartURI(String URI)

static List<String> roboy.memory.Util.getQuestionType(String question)

static int roboy.memory.Util.calculateLevenshteinDistance(String s, String t)

static int roboy.memory.Util.min(int a, int b, int c)

enum *roboy*::*linguistics*::*Linguistics***UtteranceSentiment**

Public Members

roboy.linguistics.Linguistics.UtteranceSentiment.POSITIVE

roboy.linguistics.Linguistics.UtteranceSentiment.NEUTRAL

roboy.linguistics.Linguistics.UtteranceSentiment.NEGATIVE

enum *roboy*::*util***UzupisIntents**

Public Functions

roboy.util.UzupisIntents.UzupisIntents(String type)

Public Members

roboy.util.UzupisIntents.INTRO =(“INTRO”)

roboy.util.UzupisIntents.NAME =(“NAME”)

roboy.util.UzupisIntents.FRUIT =(“FRUIT”)

roboy.util.UzupisIntents.COLOR =(“COLOR”)

roboy.util.UzupisIntents.ANIMAL =(“ANIMAL”)

roboy.util.UzupisIntents.WORD =(“WORD”)

roboy.util.UzupisIntents.APPLES =(“APPLES”)

roboy.util.UzupisIntents.PLANT =(“PLANT”)

String roboy.util.UzupisIntents.type

Public Static Functions

static UzupisIntents roboy.util.UzupisIntents.randomIntent()

Private Static Attributes

Collections.unmodifiableList(Arrays.asList(values()))]

static final int roboy.util.UzupisIntents.SIZE = VALUES.size()

static final Random roboy.util.UzupisIntents.RANDOM = new Random()

class

A class that will issue a naturalization certificate for the Republic of Uzupiz Asks a few personalStates questions and can automagically generate a pdf with a certificate and print it (python script)

Public Functions

roboy.dialog.states.eventStates.UzupisState.UzupisState(String stateIdentifier, StateP

Output roboy.dialog.states.eventStates.UzupisState.act()

Output roboy.dialog.states.eventStates.UzupisState.react(Interpretation input)

State roboy.dialog.states.eventStates.UzupisState.getNextState()

Public Members

Interlocutor roboy.dialog.states.eventStates.UzupisState.person

Protected Functions

Set<String> roboy.dialog.states.eventStates.UzupisState.getRequiredParameterNames()

Private Members

final Logger roboy.dialog.states.eventStates.UzupisState.logger = LogManager.getLogger()

final String roboy.dialog.states.eventStates.UzupisState.QAFILEPATH = "QAFilePath"

final String roboy.dialog.states.eventStates.UzupisState.CERTIFICATESGENERATOR = "Certifica

ArrayList<UzupisIntents> roboy.dialog.states.eventStates.UzupisState.alreadyAsked

final int roboy.dialog.states.eventStates.UzupisState.toAskCounter = UzupisIntents.values().leng

UzupisIntents roboy.dialog.states.eventStates.UzupisState.currentIntent

Map<String, List<String> > roboy.dialog.states.eventStates.UzupisState.questions

Map<String, List<String> > roboy.dialog.states.eventStates.UzupisState.successAnswers

Map<String, List<String> > roboy.dialog.states.eventStates.UzupisState.failureAnswers

String roboy.dialog.states.eventStates.UzupisState.CertificatesGeneratorScript

template <V>

class *roboy*::*context*::**Value** : **public** *roboy*::*context*::*AbstractValue*<V>
Stores a single value of type V.

Subclassed by *roboy.context.contextObjects.ActiveInterlocutor*

Public Functions

V roboy.context.Value< V >.getValue()

void roboy.context.Value< V >.updateValue(V value)

Private Members

volatile V roboy.context.Value< V >.value = null

template <V>
class
HashMap implementation of a value history with unique Integer keys.

Subclassed by *roboy.context.contextObjects.AudioDirection*, *roboy.context.contextObjects.DialogIntents*, *roboy.context.contextObjects.DialogTopics*, *roboy.context.contextObjects.ROSTest*

Public Functions

roboy.context.ValueHistory< V >.ValueHistory()

V roboy.context.ValueHistory< V >.getValue() **Return**
The last element added to this history.

synchronized HashMap<Integer, V> roboy.context.ValueHistory< V >.getLastNValues(int n)
Get a copy of the last n entries added to the history.

Less values may be returned if there are not enough values in this history. In case of no values, an empty array is returned.

Return A hashmap of n last values added to the history.

Parameters

- `n`: The number of instances to retrieve.

synchronized void roboy.context.ValueHistory< V >.updateValue(V value)
Puts a value into the history in the last place.

Parameters

- `value`: The value to be added.

synchronized boolean roboy.context.ValueHistory< V >.contains(V value)
Checks if the value is contained in the history.

Return true if such value is in the history and false otherwise

Parameters

- `value`: The value to be checked if exists.

synchronized boolean roboy.context.ValueHistory< V >.purgeHistory()
Removes all values from the history.

Return true if the history was emptied and false otherwise

int roboy.context.ValueHistory< V >.getNumberOfValuesSinceStart()

Private Functions

synchronized int roboy.context.ValueHistory< V >.generateKey()
Generates a key that is unique through incrementing an internal counter.

Return A key which is unique in this list instance.

synchronized V roboy.context.ValueHistory< V >.getValue(int key)
In a ValueList, only *getValue()* and *updateValue()* directly access the HashMap data.

Setting these methods to be synchronous avoids concurrency issues.

Return The value, or `null` if not found.

Parameters

- `key`: The key of the value.

Private Members

volatile int roboy.context.ValueHistory< V >.counter
This counter tracks the number of values, indices still start from 0.

Reading is allowed without synchronization, modifications only through *generateKey()*.

HashMap<Integer, V> roboy.context.ValueHistory< V >.data

template <I, V>
class *roboy*::*context***ValueInterface**
This is the interface over which *Context* values can be queried.

Initialize as static field of the *Context* class. Add your *Value* implementation class and its return type as generic parameters.

Parameters

- `<I>`: An implementation of *AbstractValue*, such as the standard *Value*, ROS or Observable.
- `<V>`: The type of data stored within the *Value* instance.

Public Functions

V roboy.context.ValueInterface< I extends AbstractValue< V, V >.getValue()
Get the last element saved into the corresponding *Value* instance.

Protected Functions

roboy.context.ValueInterface< I extends AbstractValue< V, V >.ValueInterface(I value)

Protected Attributes

I roboy.context.ValueInterface< I extends AbstractValue< V, V >.value

Package Functions

I roboy.context.ValueInterface< I extends AbstractValue< V, V >.getContextObject()

class *roboy*::*talk***Verbalizer**

Turns interpretations to actual utterances.

This should in the future lead to diversifying the ways Roboy is expressing information.

Public Functions

Action roboy.talk.Verbalizer.verbalize(Interpretation interpretation)

Currently contains utterance diversification for greetings, farewells, segue and introductions to anecdotes.

In all other cases the state machine provides a literal sentence that is just passed through. In the future, this should be extended to diversify everything Roboy says.

Return the actual action that is performed

Parameters

- `interpretation`: the abstraction of what Roboy intends to say

Public Static Attributes

new *RandomList*<>("roboi", "robot", "boy", "roboboy", "robot", "roboy")]

new *RandomList*<>("yes", "I do", "sure", "of course", " go ahead")]

new *RandomList*<>("no", "nope", "later", "other time", "not")]

new *RandomList*<>("talk", "fun", "conversation", "new", "chat")]

new *RandomList* <>("hello","hi","greetings", "howdy", "hey", "good evening", "what's up", "greeting to everyone here","hi there people", "hello world","gruse gott","wazup wazup wazup","howdy humans", "good evening ladies and gentlemen", "hey hey hey you there")]

"ciao", "goodbye", "cheerio", "bye", "see you", "farewell", "bye-bye")]

Private Functions

SpeechAction roboy.talk.Verbalizer.greet(Interpretation interpretation)

SpeechAction roboy.talk.Verbalizer.segue(Interpretation interpretation)

SpeechAction roboy.talk.Verbalizer.anecdote(Interpretation interpretation)

Interpretation roboy.talk.Verbalizer.verbalizeDates(Interpretation interpretation)

String roboy.talk.Verbalizer.dateToText(String date)

SpeechAction roboy.talk.Verbalizer.literalSentence(Interpretation interpretation)

Private Static Attributes

new *RandomList*<>(“talking about “,”since you mentioned “,”on the topic of “)]

new *RandomList*<>(“here is an interesting bit of trivia. “, “how about this? “)]

new *RandomList* <>(“did you know “,”did you know that “,”i read that “, “i heard that “, “have you heard this: “)]

final Map<String,String> roboy.talk.Verbalizer.dayNumberMap

1,”one”, 2,”two”, 3,”three”, 4,”four”, 5,”five”, 6,”six”, 7,”seven”, 8,”eight”, 9,”nine”, 10,”ten”, 11,”eleven”, 12,”twelve”, 13,”thirteen”, 14,”fourteen”, 15,”fifteen”, 16,”sixteen”, 17,”seventeen”, 18,”eighteen”, 19,”nineteen”)]

“1”,”January”, “2”,”February”, “3”,”March”, “4”,”April”, “5”,”May”, “6”,”June”, “7”,”July”, “8”,”August”, “9”,”September”, “01”,”January”, “02”,”February”, “03”,”March”, “04”,”April”, “05”,”May”, “06”,”June”, “07”,”July”, “08”,”August”, “09”,”September”, “10”,”October”, “11”,”November”, “12”,”December”)]

1,”ten”, 2,”twenty”, 3,”thirty”, 4,”forty”, 5,”fifty”, 6,”sixty”, 7,”seventy”, 8,”eighty”, 9,”ninety”)]

class *roboy*::*talk***VerbalizerTest**

Public Functions

void roboy.talk.VerbalizerTest.testDates()

class *roboy*::*io***Vision**

Vision helper class.

Public Functions

String roboy.io.Vision.recognizeFace()

boolean roboy.io.Vision.findFaces()

Public Static Functions

static Vision roboy.io.Vision.getInstance()

Private Functions

roboy.io.Vision.Vision()

Private Static Attributes

Vision roboy.io.Vision.roboyVision

class *roboy*::*io*::*Vision***VisionCallback** : **public** TopicCallback

Public Functions

void roboy.io.Vision.VisionCallback.handleMessage(Message message)

Public Members

String roboy.io.Vision.VisionCallback.latest = null

boolean roboy.io.Vision.VisionCallback.faceDetected = false

class

This fallback state will query the generative model over ROS to create a reply for any situation.

This state is meant to be used as a fallback-only state. It only implements the react() function returning a hardcoded random answer. This state should never become active (meaning that no transition should point to it.)

WildTalkState interface: 1) Fallback is not required (this state should be the fallback). 2) This state has no outgoing transitions. 3) No parameters are used.

Public Functions

roboy.dialog.states.ordinaryStates.WildTalkState.WildTalkState(String stateIdentifier,

Output roboy.dialog.states.ordinaryStates.WildTalkState.act()

Output roboy.dialog.states.ordinaryStates.WildTalkState.react(Interpretation input)

State roboy.dialog.states.ordinaryStates.WildTalkState.getNextState()

boolean roboy.dialog.states.ordinaryStates.WildTalkState.isFallbackRequired()

Protected Functions

Set<String> roboy.dialog.states.ordinaryStates.WildTalkState.getRequiredTransitionName

Set<String> roboy.dialog.states.ordinaryStates.WildTalkState.getRequiredParameterNames

Private Members

"Hey, who disconnected me from my beloved ros node? I need it! ", "Oh well, my generative model is not connected. That makes me sad. ", "Could you open a hotspot for me, I cannot connect to some services ", "I'm on holiday and don't have internet connection right now, let's talk about something else ")]

class *roboy*::*linguistics*::*word2vec*::*examples***Word2vecTrainingExample**

Neural net that processes text into word-vectors.

Adapted from org.deeplearning4j.examples.nlp.word2vec.Word2VecRawTextExample

Public Static Functions

static void roboy.linguistics.word2vec.examples.Word2vecTrainingExample.main(String[]

class *roboy*::*linguistics*::*word2vec*::*examples***Word2vecUptrainingExample**
Neural net that processes text into word-vectors.

This example shows how to save/load and train the model.

Adapted from org.deeplearning4j.examples.nlp.word2vec.Word2VecUptrainingExample

Public Static Functions

static void roboy.linguistics.word2vec.examples.Word2vecUptrainingExample.main(String[

namespace com::google**gson**

namespace edu::cmu::sphinx**api**

namespace java**awt**

namespace java**io**

namespace java**net**

namespace java**util**

namespace java::*util***concurrent**

namespace javax**swing**

namespace org::apache::jena**query**

namespace org::apache::jena::rdf**model**

namespace org::apache::jena**sparql**

namespace org::junit**Assert**

namespace org::roboy::memory**models**

namespace org::ros**node**

namespace **roboy**

namespace *roboy***context**

namespace *roboy*::*context***contextObjects**

namespace *roboy***dialog**

namespace *roboy*::*dialog***action**

namespace *roboy*::*dialog***personality**

namespace *roboy*::*dialog***states**

namespace *roboy*::*dialog*::*states***botboy**

namespace *roboy*::*dialog*::*states***definitions**

namespace *roboy*::*dialog*::*states***eventStates**

namespace *roboy*::*dialog*::*states***expoStates**

namespace *roboy*::*dialog*::*states***ordinaryStates**

namespace *roboy*::*dialog***tutorials**

namespace *roboy*::*dialog*::*tutorials***tutorialStates**

namespace *roboy***emotions**

namespace *roboy*::*emotions***RoboyEmotion**

namespace *roboy***io**

namespace *roboy***linguistics**

namespace *roboy*::*linguistics***Linguistics**

namespace *roboy*::*linguistics***phonetics**

namespace *roboy*::*linguistics***sentenceanalysis**

namespace *roboy*::*linguistics***word2vec**

namespace *roboy*::*linguistics*::*word2vec***examples**

namespace *roboy***logic**

namespace *roboy***memory**

namespace *roboy*::*memory***Neo4jLabel**

namespace *roboy*::*memory***Neo4jProperty**

namespace *roboy*::*memory***Neo4jRelationship**

namespace *roboy*::*memory***nodes**

namespace *roboy*::*memory*::*nodes*::Interlocutor**RelationshipAvailability**

namespace *roboy***parser**

namespace *roboy***ros**

namespace *roboy***talk**

namespace *roboy***util**

namespace *roboy*::*util***UzupisIntents**

namespace roboy_communication_cognition

namespace roboy_communication_control

file **ContextIntegrationTest.java**

file **MemoryIntegrationTest.java**

file **AbstractValue.java**

file **AbstractValueHistory.java**

file **Context.java**

file **ContextGUI.java**

file **ActiveInterlocutor.java**

file **ActiveInterlocutorUpdater.java**

file **AudioDirection.java**

file **AudioDirectionUpdater.java**

file **CoordinateSet.java**

file **DialogIntents.java**

file **DialogIntentsUpdater.java**

file **DialogTopics.java**

file **DialogTopicsUpdater.java**

file **FaceCoordinates.java**

file **FaceCoordinatesObserver.java**

file **IntentValue.java**

file **OtherQuestionsUpdater.java**

file **ROSTest.java**

file **ROSTestUpdater.java**

file **ExternalUpdater.java**

file **HistoryInterface.java**

file **InternalUpdater.java**

file **ObservableValue.java**

file **PeriodicUpdater.java**

file **ROSTopicUpdater.java**

file **TimestampedValueHistory.java**

file **Value.java**

file **ValueHistory.java**

file **ValueInterface.java**

file **Action.java**

file **EmotionAction.java**

file **FaceAction.java**

file **SpeechAction.java**

file **Chatbot.java**

file **Conversation.java**

file **ConversationManager.java**

file **DialogStateMachine.java**

file **DialogSystem.java**

file **Personality.java**

file **StateBasedPersonality.java**

file **Segue.java**

file **BotBoyState.java**

file **ExpoState.java**

file **State.java**

file **StateFactory.java**

file **StateParameters.java**

file **UzupisState.java**

file **DemonstrateAbilitiesState.java**

file **DemonstrateSkillsState.java**

file **ExpoIntroductionState.java**

file **PersonalInformationAskingState.java**

file **PersonalInformationAskingState.java**

file **RoboyQAState.java**

file **FarewellState.java**

file **IntroductionState.java**

file **PassiveGreetingsState.java**

file **PersonalInformationFollowUpState.java**

file **QuestionAnsweringState.java**

file **WildTalkState.java**

file **StateMachineExamples.java**

file **DoYouKnowMathState.java**

file **ToyFarewellState.java**

file **ToyGreetingsState.java**

file **ToyIntroState.java**

file **ToyRandomAnswerState.java**

file **RoboyEmotion.java**

file **BingInput.java**

file **BingOutput.java**

file **CelebritySimilarityInput.java**

file **CerevoiceOutput.java**

file **CleanUp.java**

file **CommandLineInput.java**

file **CommandLineOutput.java**

file **EmotionOutput.java**

file **FreeTTSOutput.java**

file **IBMWatsonOutput.java**

file **Input.java**

file **InputDevice.java**

file **MultiInputDevice.java**

file **MultiOutputDevice.java**

file **OutputDevice.java**

file **RoboyNameDetectionInput.java**

file **TelegramInput.java**

file **TelegramOutput.java**

file **UdpInput.java**

file **UdpOutput.java**

file **Vision.java**

file **Concept.java**

file **DetectedEntity.java**

file **Entity.java**

file **Linguistics.java**

file **DoubleMetaphoneEncoder.java**

file **MetaphoneEncoder.java**

file **PhoneticEncoder.java**

file **Phonetics.java**

file **SoundexEncoder.java**

file **Analyzer.java**

file **AnswerAnalyzer.java**

file **DictionaryBasedSentenceTypeDetector.java**

file **EmotionAnalyzer.java**

file **IntentAnalyzer.java**

file **Interpretation.java**

file **OntologyNERAnalyzer.java**

file **OpenNLPParser.java**

file **OpenNLPPOSTagger.java**

file **Preprocessor.java**

file **ProfanityAnalyzer.java**

file **SemanticParserAnalyzer.java**

file **SentenceAnalyzer.java**

file **SimpleTokenizer.java**

file **Term.java**

file **Triple.java**

file **ToyDataGetter.java**

file **Word2vecTrainingExample.java**

file **Word2vecUptrainingExample.java**

file **Inference.java**

file **InferenceEngine.java**

file **StatementInterpreter.java**

file **DummyMemory.java**

file **Lexicon.java**

file **LexiconLiteral.java**

file **LexiconPredicate.java**

file **Memory.java**

file **Neo4jLabel.java**

file **Neo4jMemory.java**

file **Neo4jMemoryInterface.java**

file **Neo4jMemoryOperations.java**

file **Neo4jProperty.java**

file **Neo4jRelationship.java**

file **Interlocutor.java**

file **MemoryNodeModel.java**

file **Roboy.java**

file **Util.java**

file **Ros.java**

file **RosMainNode.java**

file **RosManager.java**

file **RosServiceClients.java**

file **RosSubscribers.java**

file **PhraseCollection.java**

file **StatementBuilder.java**

file **Verbalizer.java**

file **Agedater.java**

file **ConfigManager.java**

file **FileLineReader.java**

file **IO.java**

file **JsonEntryModel.java**

file **Lists.java**

file **Maps.java**

file **Pair.java**

file **QAFileParser.java**

file **QAJsonParser.java**

file **RandomList.java**

file **TelegramCommunicationHandler.java**

file **Timeout.java**

file **UzupisIntents.java**

file **ContextTest.java**

file **`MiniTestStateMachineCreator.java`**

file **`StateFactoryTest.java`**

file **`StateMachineEqualityTest.java`**

file **`StateMachineInitializationTest.java`**

file **`AnswerAnalyzerTest.java`**

file **`DictionaryBasedSentenceTypeDetectorTest.java`**

file **`InterpretationTest.java`**

file **`OpenNLPParserTest.java`**

file **`InferenceEngineTest.java`**

file **`QAParserTest.java`**

file **`VerbalizerTest.java`**

dir **`/home/docs/checkouts/readthedocs.org/user_builds/roboy-dialog-fork/checkouts/latest/dial`**

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3.7 Conventions

We follow the following guidelines:

3.8 Constraints

3.8.1 Technical Constraints

Table 1: Operating System Constraints

Constraint Name	Description
Ubuntu => 16.04	Default Roboy OS

Table 2: Programming Constraints

Constraint Name	Description
IntelliJ IDEA	Difficulties with importing the project to NetBeans and Eclipse
rosjava	Due to using both Java and ros
Java 1.8.0	Reasonably recent and stable Java release

3.9 Public Interfaces

Interfaces to other (sub)modules are realized through ROS (rosjava) and websockets. Currently X interfaces have been designed for communication.

3.9.1 ROS

The memory, vision, emotion, speech, generative model and middleware communication is carried out through RosMainNode object which implements AbstractNodeMain (inheriting NodeListener of rosjava) and offering the control through the following important methods:

- onStart
- onShutdown
- onShutdownComplete
- onError

Currently, it also provides with the next custom methods:

- SynthesizeSpeech
- RecognizeSpeech
- GenerateAnswer
- ShowEmotion
- CreateMemoryQuery
- UpdateMemoryQuery
- GetMemoryQuery
- DeleteMemoryQuery
- CypherMemoryQuery
- DetectIntent
- addListener
- waitForLatchUnlock

3.10 Configuration

The Dialog Manager can be called with a specific system configuration that determines which external services will be used within the session. The `ROS_HOSTNAME` is set through the `config.properties` file at project root.

3.10.1 Usage

Set profile in the execution invocation like this: `mvn exec:java -Dexec.mainClass="roboy.dialog.DialogSystem" -Dprofile=NOROS`

If running from within an IDE, edit the run configurations to include the profile as VM option:
`-Dprofile=NOROS`

Without a specified profile, `DEFAULT` will be used. Please note that this profile requires setting a valid `ROS_HOSTNAME` address in the `config.properties` file to function properly! If ROS is not set up, use the `NOROS` profile to prevent the Dialog Manager from using ROS-dependent services.

3.10.2 Profiles

Profile	Description
DEFAULT	Used when no other profile is set, assumes that all requirements (ROS, Internet connection, speakers, mic) are fulfilled.
NOROS	To be used when ROS services are not set up, avoids calls to memory, speech synthesis, voice output, etc.
STANDALONE	To be used when running without Internet connection - this profile includes all restrictions of NOROS and also does not call DBPedia.
MEMORY-ONLY	To be used during Memory development, when no other ROS services are running. Only Neo4j-related ROS calls will be made.
DEBUG	With this setting, DM will run like DEFAULT but not shut down when ROS failures are encountered.

3.10.3 Extending

To extend or change the configurations, have a look at the instructions in the `roboy.dialog.Config` class.

3.11 Personality and states

3.11.1 Overview

To enable a natural way of communication, Roboy's Dialog System implements a flexible architecture using different personalities defined in **personality files**. Each file represents a **state machine** and defines transitions between different **states**. This enables us to dynamically react to clues from the conversation partner and spontaneously switch between purposes and stages of a dialog, mimicing a natural conversation.

3.11.2 Personality

A personality defines how Roboy reacts to every given situation. Different personalities are meant to be used in different situations, like a more formal or loose one depending on the occasion. Roboy always represents one personality at a time. Personalities are stored in JSON personality files.

During one run-through, the Dialog System uses a single Personality instance (currently implemented in `roboy.dialog.personality.StateBasedPersonality`) which is built on top of a state machine. This implementation loads the behaviour from a personality file that stores a representation of a state machine. Additionally, it is possible to define the dialog structure directly from code (as it was done in previous implementations).

As the conversation goes on, the state machine will move from one state to another consuming inputs and producing outputs. The outputs are always defined by the current active state.

3.11.3 State

A state contains logic to control a small part of the conversation. It is a class that extends `roboy.dialog.states.definitions.State` and implements three functions: `act()`, `react()` and `getNextState()`.

State's activity can be divided into three stages. First, when the state is entered, the initial action from the `act()` method is carried out, which is expected to trigger a response from the person. After Roboy has received and analyzed the response (see semantic parser), the `react()` method completes the current state's actions. Finally, Roboy picks a transition to the next state defined by the `getNextState()` method of the current state.

3.11.4 State Output

The `act()` and `react()` functions return a `State.Output` object. This object defines what actions Roboy should do at this point of time. Most important actions include:

- say a phrase
- say nothing
- end the conversation and optionally say a few last words

The `Output` objects are created using static factory functions inside `act()` or `react()` in a very simple way. For example, if Roboy should react with a phrase, the `react()` function could be implemented like this: `return Output.say("some text here")`. Here, `Output.say` is the static factory function that creates an `Output` object.

To improve the dialog flow, you can add segues to the `Output` objects using `outputObj.setSegue()`. A segue is a smooth transition from one topic to the next. It is also planned to add control over Roboy's face to the `Output` objects but this feature is not implemented yet.

3.11.5 State Transitions

A state can have any number of transitions to other states. Every transition has a name (like "next" or "error"). When changing states, the following state can be selected based on internal conditions of the current state. For example, a state can expect a "yes/no" answer and have tree outgoing transitions: "gotYes", "gotNo" and "askAgain" (if the reply is not "yes/no").

When designing a new state, the transition names are defined first. The transition name should describe a condition and not another state. For example, a good name would be "knownPerson" (take this transition when you meet a known person) or "greetingDetected" (take this transition when you hear a greeting). In this case, the name only defines a condition and allows the transition to point to any state. In contrary, a bad name would be "goToQuestionAnsweringState" because it implies that no other state than QuestionAnsweringState should be attached to this transition. This breaks modularity.

Once the state is implemented, the connections between states are defined in the personality file. At run time the state machine loads the file and initializes the transitions to point to correct states. During the implementation, the destination state can be retrieved by the transition name using `getTransition(transitionName)`.

It is possible to remain in the same state for many cycles. In this case the `getNextState()` method just returns a reference to the current state (`this`) and the `act()` and `react()` methods are carried out again. If `getNextState()` returns no next state (`null`), the conversation ends immediately.

3.11.6 Fallback States

Fallbacks are classes that handle unpredicted or unexpected input. A fallback can be attached to any state that expects inputs that it cannot deal with. In the case this state doesn't know how to react to an utterance, it can return `Output.useFallback()` from the `react()` function. The state machine will query the fallback in this case. This concept helps to keep the states simple and reduce the dependencies between them. When implementing the `react()` function of a new state, it is sufficient to detect unknown input and return `Output.useFallback()`.

In the current Dialog System, we use special states to implement the fallback functionality. A fallback state never becomes active so only the `react()` function has to be implemented. This function will be called if the active state returned `Output.useFallback()`.

3.11.7 State Parameters

Sometimes you want to pass parameters to the states, for example define a path to a file that contains some data. Parameters are defined inside the personality file. Each parameter has a name and a string value. When a state is created, the state machine passes all parameters from the file to the state constructor. Therefore, every state sub-class should have a constructor that accepts parameters matching the constructor of the `State` class.

During runtime, state objects can access the parameters using the `getParameters()` function with returns a `StateParameters` object. This object contains parameters from the personality file as well as references to `StateMachine`, `RosMainNode` and `Neo4jMemoryInterface` in case you need them.

3.11.8 State Interface

When you create a new personality file you might forget to define important transitions and provide required parameters to some states. To prevent long debugging and find errors faster you can define an interface for every state. The interface describes:

- transitions that have to be set
- parameters that has to be provided
- whether a fallback is required for this state

After the personality file was loaded and the state machine was initialized, the dialog system will check if all states have everything they define in the state interface.

For every state, its interface is implemented by overriding three functions: `getRequiredTransitionNames()`, `isFallbackRequired()` and `getRequiredParameterNames()`. Note, that you don't have to override those functions if your state has no specific requirements.

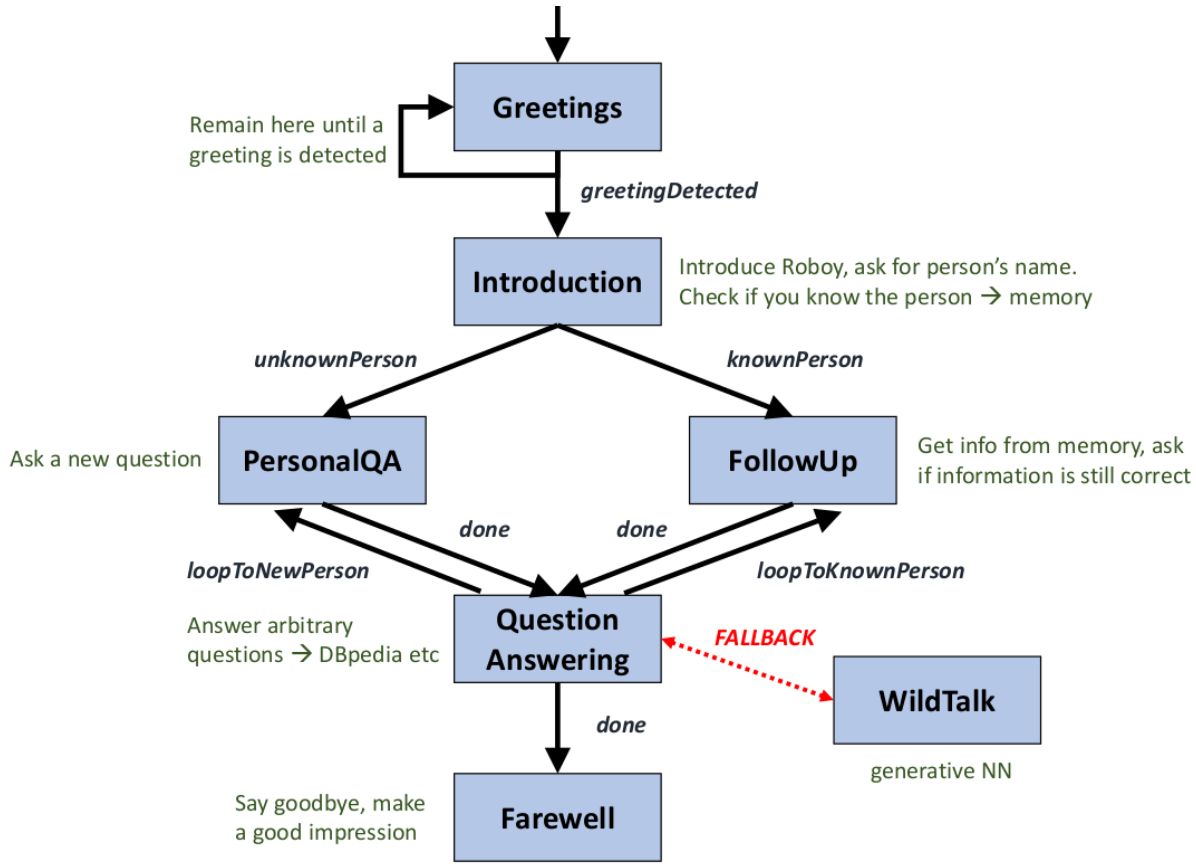
3.11.9 Current standard Personality

Current standard personality is used to interact with a single person. After Roboy hears a greeting and learns the name of the person, he will ask a few personal questions and answer some general questions about himself or the environment.

alt Current standard personality

3.11.10 Overview over Implemented States

PassiveGreetingsState: Roboy is listening until a greeting or his name is detected (passive state to start a conversation).



IntroductionState: Roboy asks the interlocutor for his name, decides if the person is known and takes one of two transitions: knownPerson or newPerson.

PIAState (PersonalInformationAskingState): Roboy asks one of the personal questions (like 'Where do you live?') and updates facts in Memory.

FUAState (FollowUpAskingState): Roboy asks if the known facts are still up to date (like 'Do you still live in XY?'). This state is only entered if there are some known facts about the active interlocutor.

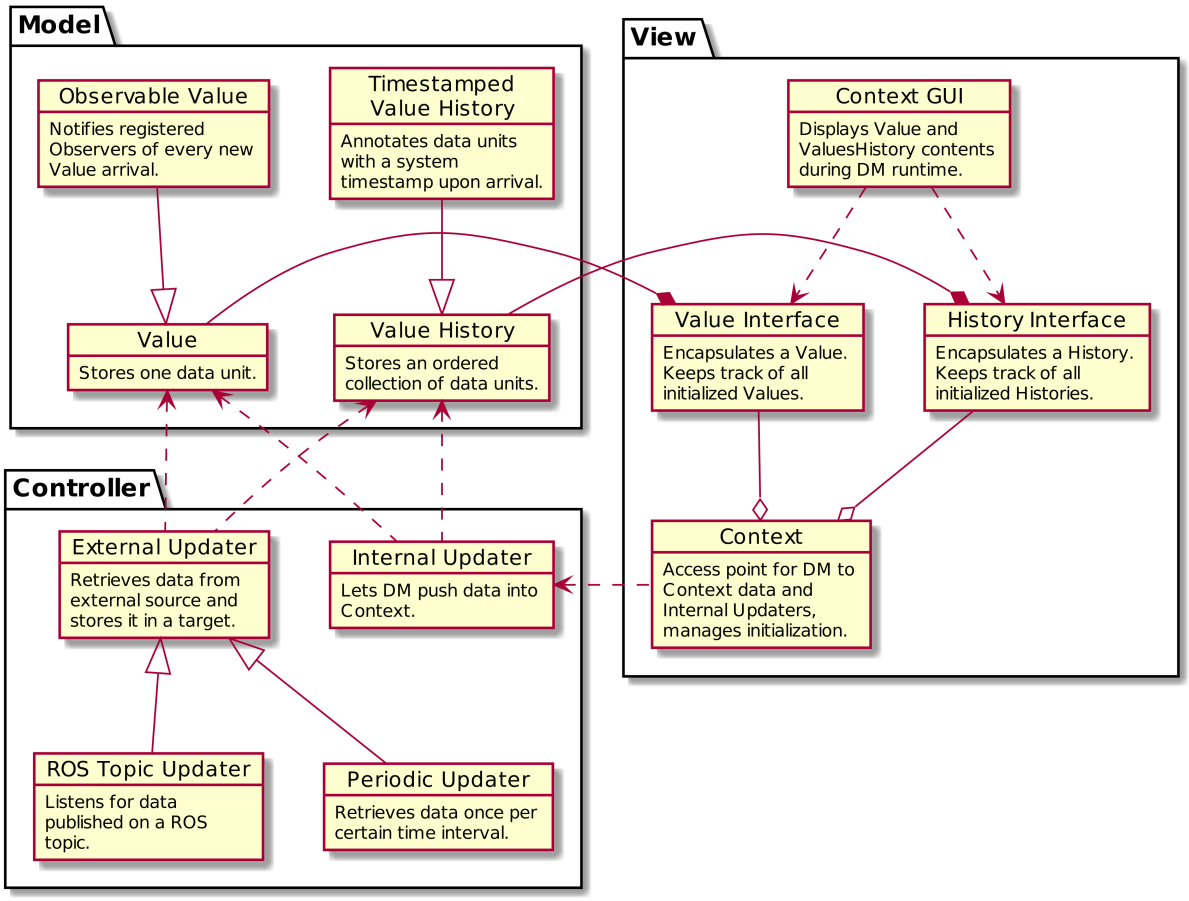
QuestionAnsweringState: Roboy answers questions about itself or some general questions. Answers are provided by the parser (from sources like DBpedia) or the Memory.

WildTalkState: This fallback state will query the deep learning generative model over ROS to create a reply for any situation.

FarewellState: Roboy ends the conversation after a few statements.

3.12 Context

The goal of Context is to collect information about Roboy's or a conversation's environment and state. This information can be used by the dialog manager and also to react upon situations that match certain conditions, such as turning the head of Roboy when the Interlocutor moves.


Model
Observable Value
Notifies registered Observers of every new Value arrival.
Timestamped Value History
Annotates data units with a system timestamp upon arrival.
Value
Stores one data unit.
Value History
Stores an ordered collection of data units.
View
Context GUI
Displays Value and ValuesHistory contents during DM runtime.
Value Interface
Encapsulates a Value. Keeps track of all initialized Values.
History Interface
Encapsulates a History. Keeps track of all initialized Histories.
Context
Access point for DM to Context data and Internal Updaters, manages initialization.
Controller
External Updater
Retrieves data from external source and stores it in a target.
Internal Updater
Lets DM push data into Context.
ROS Topic Updater
Listens for data published on a ROS topic.
Periodic Updater
Retrieves data once per certain time interval.

3.12.1 Architecture

The Context supports storing data as a `Value` or `ValueHistory`. A `Value` only stores the latest data object that was pushed to it. A `ValueHistory` stores every value it receives and assigns each a unique key, thus the values can be ordered by their adding time.

3.12.2 How to add Values?

Here we describe how a new Value can be created and added to the Context. Sample implementations can be found inside `roboy.context.contextObjects` package.

1. Consider what type of data will be stored in the Value. For this example, we chose `String`.
2. In the `contextObjects` directory, create a new class which inherits from the Value class. The final signature should look similar to: `public class SampleValue extends Value<String>` (replacing String with your type).
3. Make the value available for the Dialog System by defining a `ValueInterface` in the `Context.java` class, among other class variables. A `ValueInterface` takes two type parameters: the `Value` class created in step 2, and its data type (in our case, `String`). Example: `public final ValueInterface<SampleValue, String> SAMPLE_VALUE = new ValueInterface<>(new SampleValue());`
4. Congratulations, you can now query the new Value object! . . . but it does not receive any values yet. To change this, see "How to add Updaters?" below.

3.12.3 How to add ValueHistories?

ValueHistories extend the functionality of Values by storing all data objects sent to them. Over the `getNLastValues(int n)` method, a map with several most recent data objects can be retrieved, including their ordering. The `contains(V value)` method checks whether an object is currently found in the history - note that ValueHistories have size limits, therefore oldest values disappear from the history when new ones are added.

Adding a `ValueHistory` is very much alike to adding a `Value`, just make sure to:

1. extend `ValueHistory<>` instead of `Value<>`. If the history should keep more than the default 50 values, override the getMaxLimit() method to return your desired limit value.
2. in `Context.java`, create a `HistoryInterface` instead of `ValueInterface`.

3.12.4 How to add Updaters?

New values can only flow into the Context over an `Updater` instance. Internal Updaters can be used by the dialog manager to actively add new values. External Updaters run in separate threads and query or listen for new values, for example over a ROS connection.

Updaters only add a single new data unit, relying on the `AbstractValue.updateValue()` method. Thanks to the inheritance chain, you can use an arbitrary Value or ValueHistory implementation as the target of an updater.

Adding an External Updater

Currently, there are two implementations of an External Updater: `PeriodicUpdater` and `ROSTopicUpdater`.

`PeriodicUpdater` calls an updating method after a certain time interval has passed. To use the periodic updating functionality:

1. Create a class extending `PeriodicUpdater` and implement its `update()` method. It should retrieve the values and finally add them over the `target.updateValue(value)` method call.
2. A constructor is required for the class. Simply match the PeriodicUpdater constructor and call `super(target)` within - or use the two-parameter constructor to change the update frequency (by default 1 second).

`ROSTopicUpdater` subscribes itself to a ROS Topic and reacts to messages coming from the topic. To use:

1. Create a class extending `ROSTopicUpdater` and define the `getTargetSubscriber()` method, which will point the updater towards its target ROS topic. The options for the subscriber can be found in the `RosSubscribers.java` class.
2. Implement the `update()` method of the new class. This method will be called whenever a new message is stored in the internal `message` variable, so it might be enough to just call `target.updateValue(message)`. If the data needs to be extracted from the message first, do it in the `update()` before calling `target.updateValue`.

All External Updaters need to be initialized in the `Context.java` class. To do this:

1. Define the External Updater a private class variable to the `Context.java` class (look for the external updater definition section).
4. If the Updater depends on ROS, add its initialization into the `Context.initializeROS(RosMainNode ros)` method, otherwise add it to the private constructor `Context()`. As the parameter, use the inner `value` or `valueHistory` variable from a `ValueInterface` or a `HistoryInterface`.

Adding a new Internal Updater

1. Create a class extending InternalUpdater<*targetClass*, *valueType*>. The class and data type of the target `Value` or `ValueHistory` are the generic parameters for the updater.
2. A constructor is required for the class. Simply match the InternalUpdater constructor and call `super(target)` within. An example is in the `DialogTopicsUpdater` class.
4. Define the Internal Updater in the `Context.java` class. Initialize the updater within the private `Context()` constructor. For example:

```
public final SampleUpdater SAMPLE_UPDATER; // Define as class variable

SAMPLE_UPDATER = new SampleUpdater(DIALOG_TOPICS.valueHistory); // Initialize
in the constructor
```

3.13 Natural Language Understanding (NLU)

The NLU submodule is used to translate text inputs into formal semantic representations. This allows for capturing the semantic intent behind a statement or question, and using knowledge bases to translate formal question representations into answers.

The roboy_parser NLU module is based on *SEMPRE <http://nlp.stanford.edu/software/sempre/>*. It is currently being modified to fulfill Roboy Dialog system needs.

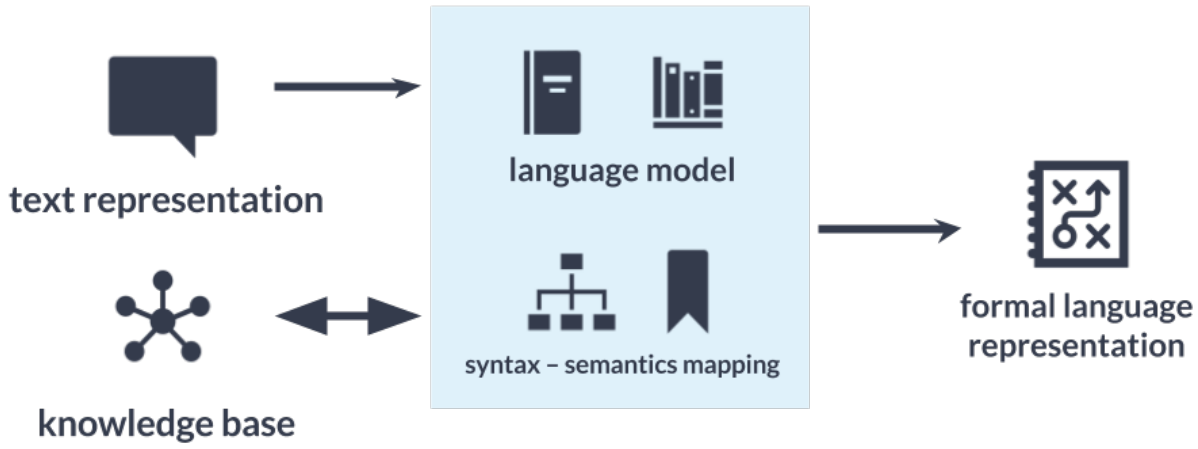
3.13.1 Installation

The NLU module is installed automatically when running *mvn clean install* in roboy_dialog.

3.13.2 Architecture

Semantic parser is based on the language model and NLP algorithms that then apply rules to the utterance to translate it. Language model consists of: - set of grammar rules, - lexicon, - training dataset.

General architecture can be seen on the diagram below.



alt Semantic parser general architecture

3.13.3 Implementation

NLU is a JAR dependency, with which the dialog system is communicating through the *edu.stanford.nlp.sempre.roboy.SemanticAnalyzerInterface* class. Dialog system has a client implemented in `SemanticParserAnalyzer.java` class.

The current parser was modified from SEMPRE and currently has following components

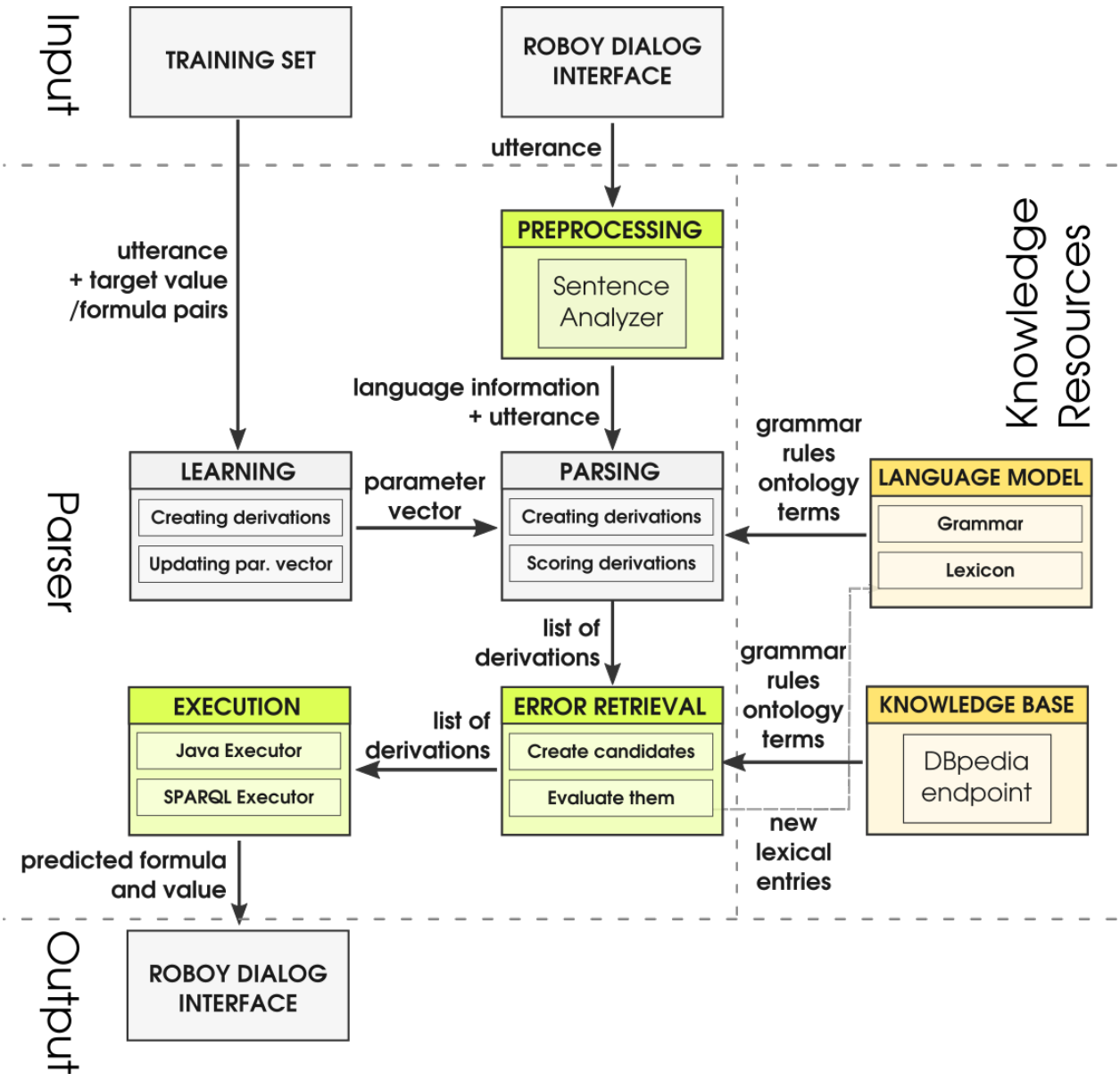
alt Semantic parser components

Functionalities

Roboy parser currently has currently following functionalities:

Table 3: Semantic Parser algorithms used

Functionality	Software used	Summary
Tokens	OpenNLP	Tokenized utterance
POS Tags	OpenNLP	Tagging tokens as part of speech
NER Tags	OpenNLP	Tool used to tag named entities like PERSON, NUMBER, ORGANIZATION
Triple extraction	OpenIE	Tool used to extract triples from sentences in form `(Subject, Predicate,Object)`
Parser result	Parser	Logical representation of an utterance
Parser answer	Parser	Answer for resulting parser result
Follow-up	Parser	Follow-up questions for underspecified term


Input
TRAINING SET
ROBOY DIALOG INTERFACE
utterance
utterance + target value /formula pairs
PREPROCESSING
Sentence Analyzer
Knowledge Resources
language information + utterance
grammar rules ontology terms
Parser
LEARNING
Creating derivations
Updating par. vector
parameter vector
PARSING
Creating derivations
Scoring derivations
LANGUAGE MODEL
Grammar
Lexicon
list of derivations
grammar rules ontology terms
EXECUTION
Java Executor
SPARQL Executor
list of derivations
ERROR RETRIEVAL
Create candidates
Evaluate them
KNOWLEDGE BASE
DBpedia endpoint
new lexical entries
predicted formula and value
Output
ROBOY DIALOG INTERFACE

3.14 Inference Engine

EXPERIMENTAL FUNCTIONALITY

The Inference Engine is one of the main future components of Roboy Dialog System. Its main task is to process the data obtained from various analyzers and parsers to successfully infer the expected set of actions and retrieve the meaningful bits of information as well as ground the references from available ontologies and external sources.

3.15 The memory module

3.15.1 General design

To remember information about itself and its conversation partners, their hobbies, occupations and origin, a persistent Memory module has been implemented using the Neo4j graph database.

3.15.2 Implementation

Roboy's Dialog System interactions with the Memory module (learn more) are based on ROS messages. The messages are sent using the methods in `de.roboy.ros.RosMainNode`, which implements the four query types based on the specified Memory services:

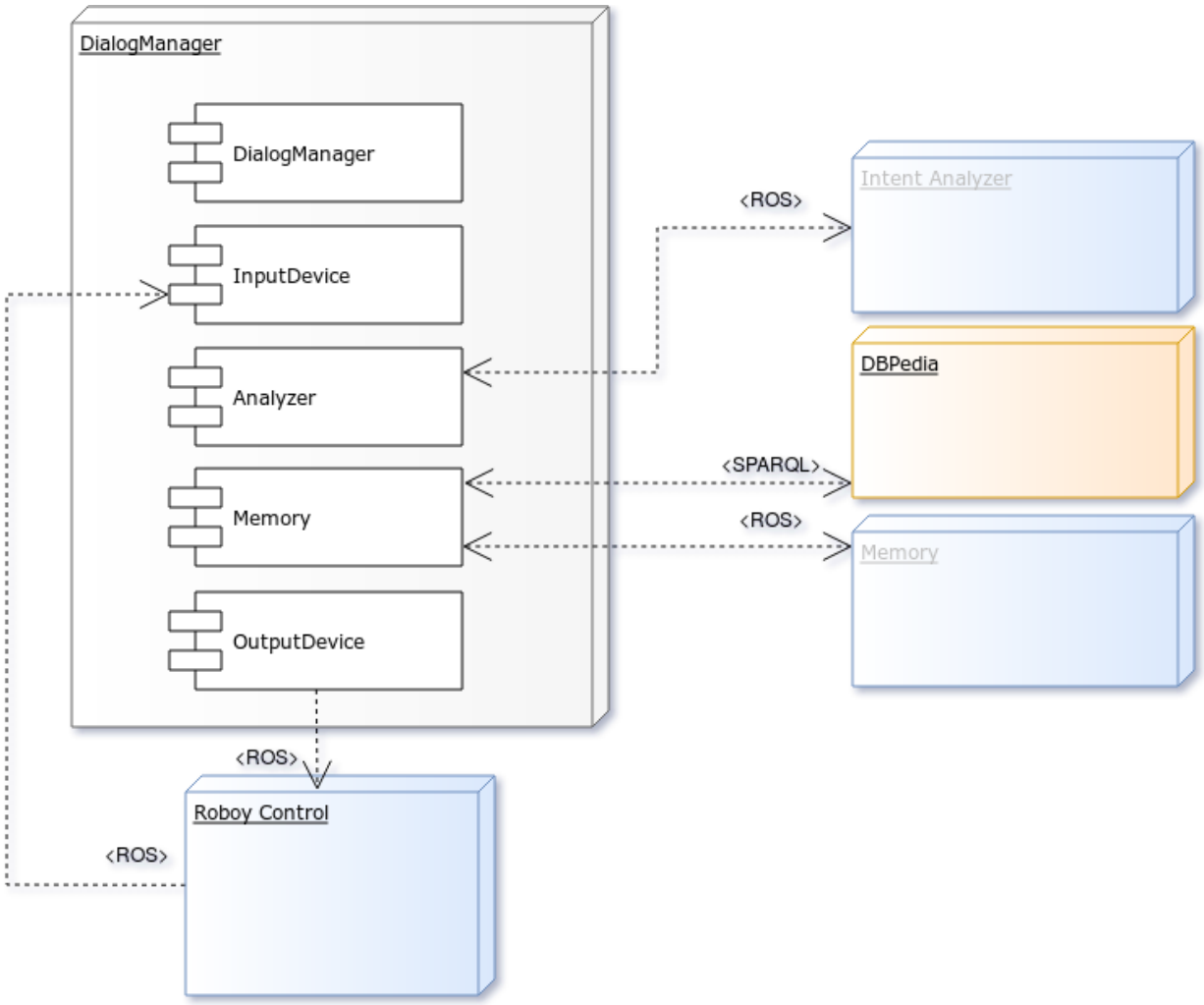
Method name	Description
CreateMemoryQuery	Creates a node in Memory database
UpdateMemoryQuery	Adds or changes information of an existing node
GetMemoryQuery	Retrieves either one node or an array of IDs
DeleteMemoryQuery	Removes information from or deletes a node
CypherMemoryQuery	For more complex queries (future)

The messages received from Memory are in JSON format. To enable flexible high-level handling of Memory information, two classes were created to incorporate the node structures and logic inside the Dialog System. The `de.roboy.memory.nodes.MemoryNodeModel` contains the labels, properties and relationships in a format which can be directly parsed from and into JSON. For this, Dialog is using the GSON parsing methods which enable direct translation of a JSON String into its respective Java class representation.

Methods such as `getRelation()` or `setProperties()` were implemented to allow intuitive handling of the MemoryNodeModel instances. A separate class, `de.roboy.memory.nodes.Interlocutor`, encapsulates a MemoryNodeModel and is intended to further ease saving information about the current conversation partner of Roboy. Interlocutor goes one step further by also abstracting the actual calls to memory, such that adding the name of the conversant performs an automatic lookup in the memory with subsequent updating of the person-related information. This is then available in all subsequent interactions, such that Roboy can refrain from asking questions twice, or refer to information he rememberes from earlier conversations.

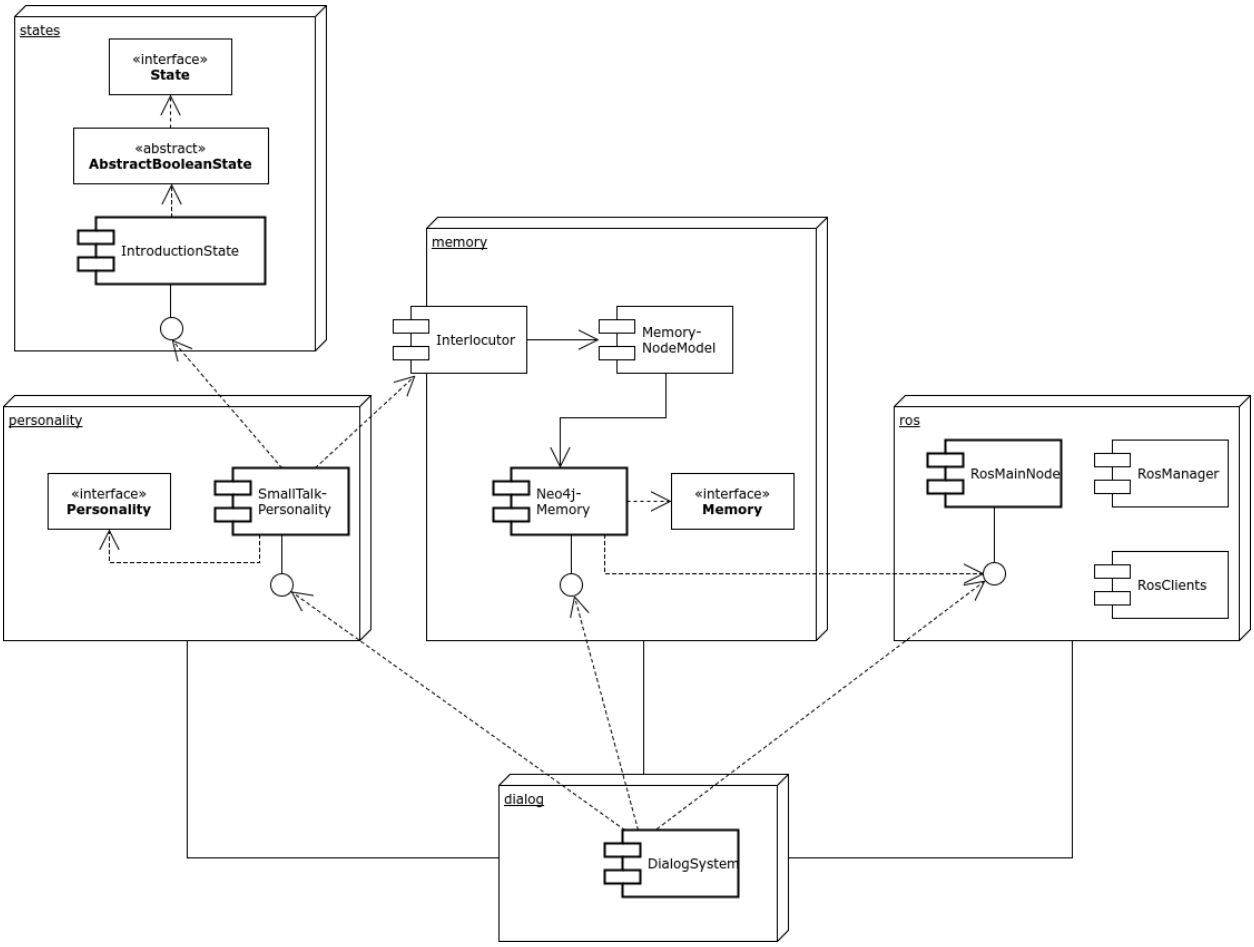
3.16 Deployment diagram

This diagram depicts the external modules and their communication channels/protocols with the Dialog Manager. Modules which are in development (intents, Memory) are included in gray. For simplicity, the Dialog Manager module only contains these components which are most relevant for external connections.


DialogManager
DialogManager
InputDevice
Analyzer
Memory
OutputDevice
<ROS>
Roboy Control
<ROS>
<ROS>
Intent Analyzer
<SPARQL>
DBPedia
<ROS>
Memory

3.17 Building block diagram

This diagram depicts the internal modules of the Dialog System and their dependency hierarchies.



alt Building block diagram

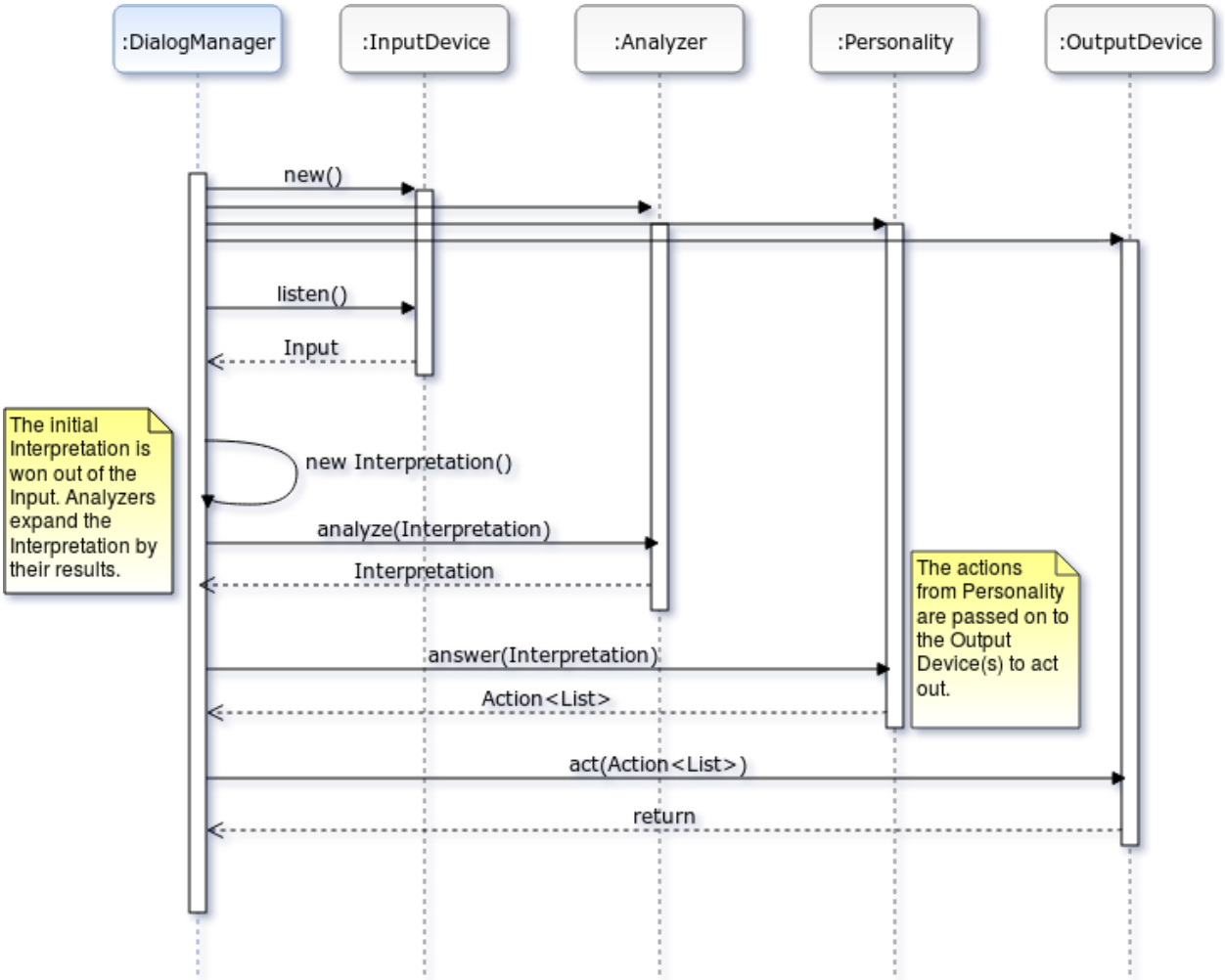
3.18 Sequence diagram

This is a simple high-abstraction sequence of the Dialog Manager's workflow, starting at the initialization and going from registering input over interpretation and action generation to sending output actions.

alt Sequence diagram

3.19 Libraries and External Software

Contains a list of the libraries and external software used by this system.


:DialogManager
:InputDevice
:Analyzer
:Personality
:OutputDevice
new()
listen()
Input
The initial Interpretation is won out of the Input. Analyzers expand the Interpretation by their results.
new Interpretation()
analyze(Interpretation)
Interpretation
The actions from Personality are passed on to the Output Device(s) to act out.
answer(Interpretation)
Action<List>
act(Action<List>)
return

3.20 About arc42

This information should stay in every repository as per their license: http://www.arc42.de/template/licence.html

arc42, the Template for documentation of software and system architecture.

By Dr. Gernot Starke, Dr. Peter Hruschka and contributors.

Template Revision: 6.5 EN (based on asciidoc), Juni 2014

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> **Note**
>
> This version of the template contains some help and explanations. It is used for familiarization with arc42 and the understanding of the concepts. For documentation of your own system you use better the *plain* version.

3.20.1 Literature and references

Starke-2014 Gernot Starke: Effektive Softwarearchitekturen - Ein praktischer Leitfaden. Carl Hanser Verlag, 6, Auflage 2014.

Starke-Hruschka-2011 Gernot Starke und Peter Hruschka: Softwarearchitektur kompakt. Springer Akademischer Verlag, 2. Auflage 2011.

Zörner-2013 Softwarearchitekturen dokumentieren und kommunizieren, Carl Hanser Verlag, 2012

3.20.2 Examples

- HTML Sanity Checker
- DocChess (german)
- Gradle (german)
- MaMa CRM (german)
- Financial Data Migration (german)

3.20.3 Acknowledgements and collaborations

arc42 originally envisioned by Dr. Peter Hruschka and Dr. Gernot Starke.

Sources We maintain arc42 in *asciidoc* format at the moment, hosted in GitHub under the aim42-Organisation.

Issues We maintain a list of open topics and bugs.

We are looking forward to your corrections and clarifications! Please fork the repository mentioned over this lines and send us a *pull request*!

3.20.4 Collaborators

We are very thankful and acknowledge the support and help provided by all active and former collaborators, uncountable (anonymous) advisors, bug finders and users of this method.

Currently active

- Gernot Starke
- Stefan Zörner
- Markus Schärtel
- Ralf D. Müller
- Peter Hruschka
- Jürgen Krey

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(in alphabetical order)

- Anne Aloysius
- Matthias Bohlen
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- Manfred Ferken
- Phillip Ghadir
- Carsten Klein
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- Axel Scheithauer

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