

(RoboStar Framework) RoboWorld in RoboTool

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19th of August, 2022



Setup 1 (before the lecture): RoboWorld editor

1. Download a fresh copy of Eclipse IDE for Java Developers (Linux x86_64)
<https://www.eclipse.org/downloads/packages/release/2021-12/r>
2. Extract the contents of the .tar.gz file
3. Download the RoboWorld plug-in (jar file)
<https://seisummerschool.github.io/2022/materials.html>
4. Copy the .jar file to eclipse/plugins

Setup 2 (before the lecture): Grammatical Framework

1. Install dependencies
 - ▶ Depends on libtinfo5; install if not installed before
(sudo apt install libtinfo5)
 - ▶ Depends on libffi6; install if not installed before
https://ubuntu.pkgs.org/18.04/ubuntu-main-amd64/libffi6_3.2.1-8_amd64.deb.html
(sudo dpkg -i libffi6_3.2.1-8_amd64.deb)
2. Download the Grammatical Framework 3.10
<https://seisummerschool.github.io/2022/materials.html>
3. Install the Grammatical Framework 3.10
(sudo dpkg -i gf_3.10-2_amd64.deb)
4. Test the installation
(type gf in the terminal, this should open GF terminal; type q to quit)

Setup 3 (before the lecture): sample project

1. Download the sample project (Fire Fighter)
<https://seisummerschool.github.io/2022/materials.html>
2. Extract the contents of the .zip file
3. Run Eclipse IDE for Java Developers
4. Import the FireFighter project
(File > Import > General > Existing Projects into Workspace)
5. Open the file FireFighter.env
(RoboWorld editor should open)

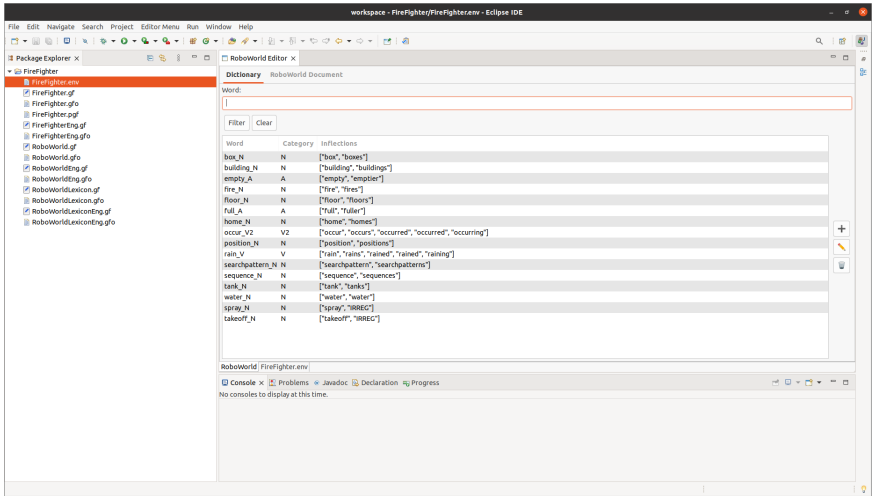
Outline

- ▶ Demonstration (10 min)
- ▶ Break
- ▶ Practical session (20 min)

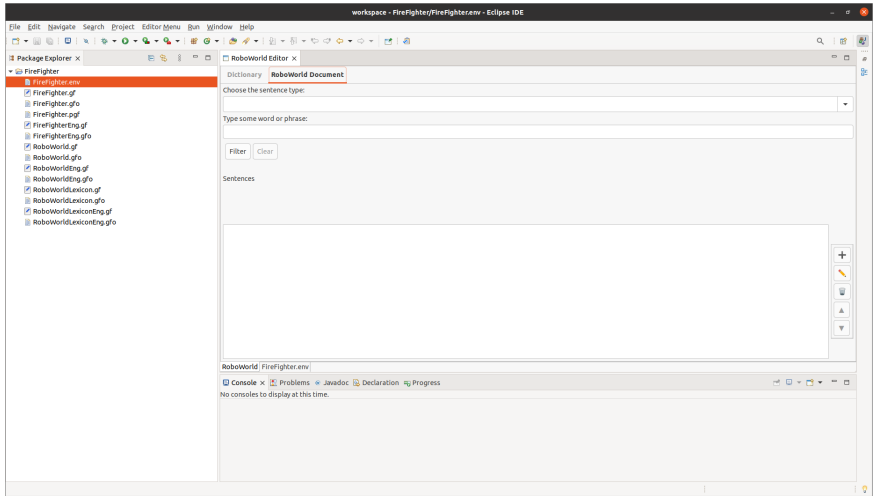
Outline

- ▶ **Demonstration** (10 min)
- ▶ Break
- ▶ Practical session (20 min)

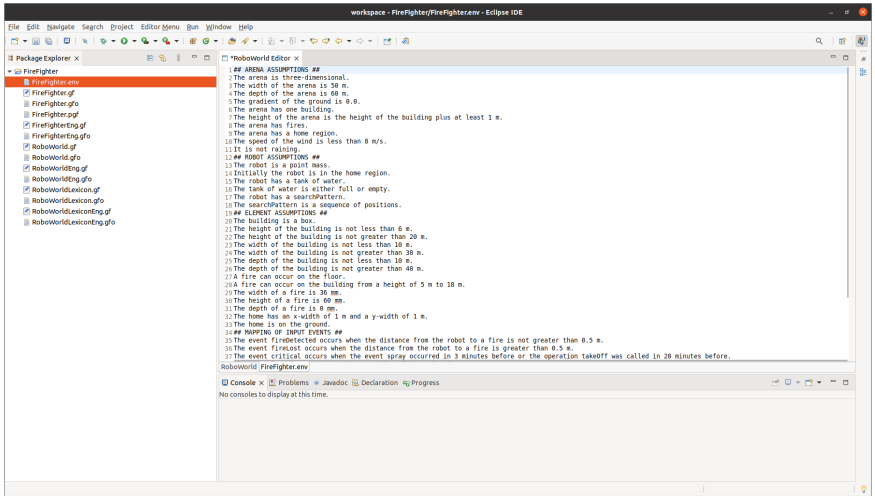
Dictionary: Add/Edit/Delete words



RoboWorld Document: Add/Edit/Delete sentences

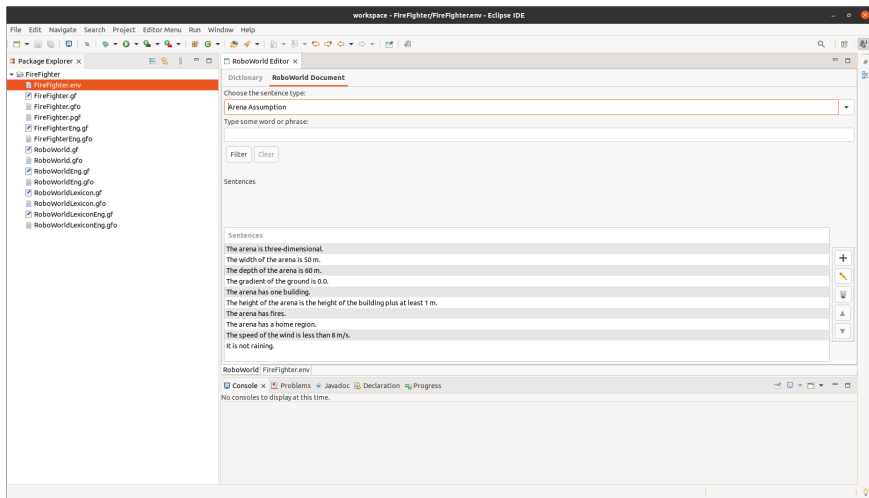


RoboWorld Document: raw format

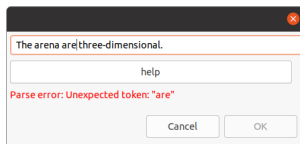


```
workspace - FireFighter/FireFighter.ewb - Eclipse IDE
File Edit Navigate Search Project Editor Menu Run Window Help
Package Explorer x
  FireFighter
    FireFighter.ewb
    FireFighter.gf
    FireFighter.gfo
    FireFighter.pg
    FireFighterEng.gf
    FireFighterEng.gfo
    RoboWorld.gf
    RoboWorld.gfo
    RoboWorldEng.gf
    RoboWorldEng.gfo
    RoboWorldLexicon.gf
    RoboWorldLexiconEng.gf
    RoboWorldLexiconEng.gfo
  *RoboWorld Editor x
    1 ## ARENA ASSUMPTIONS ##
    2 The arena is three-dimensional.
    3 The width of the arena is 50 m.
    4 The depth of the arena is 60 m.
    5 The gradient of the ground is 0.0.
    6 The arena has one building.
    7 The height of the arena is the height of the building plus at least 1 m.
    8 The arena has fires.
    9 The arena has a home region.
    10 The speed of the wind is less than 0 m/s.
    11 It is not raining.
    12 ## ROBOT ASSUMPTIONS ##
    13 The robot is a point mass.
    14 Initially the robot is in the home region.
    15 The robot has a tank of water.
    16 The tank of water is either full or empty.
    17 The robot has a searchPattern.
    18 The searchPattern is a sequence of positions.
    19 ## ELEMENT ASSUMPTIONS ##
    20 The building is a box.
    21 The height of the building is not less than 6 m.
    22 The height of the building is not greater than 20 m.
    23 The width of the building is not less than 10 m.
    24 The width of the building is not greater than 30 m.
    25 The depth of the building is not less than 10 m.
    26 The depth of the building is not greater than 40 m.
    27 A fire can occur on the floor.
    28 A fire can occur on the building from a height of 5 m to 18 m.
    29 The width of a fire is 30 mm.
    30 The height of a fire is 60 mm.
    31 The depth of a fire is 0 mm.
    32 The home has an x-width of 1 m and a y-width of 1 m.
    33 The home is on the ground.
    34 ## MAPPING OF INPUT EVENTS ##
    35 The event fireDetected occurs when the distance from the robot to a fire is not greater than 0.5 m.
    36 The event fireLost occurs when the distance from the robot to a fire is greater than 0.5 m.
    37 The event critical occurs when the event spray occurred in 3 minutes before or the operation takeOff was called in 20 minutes before.
    RoboWorld FireFighter.ewb
    Console x Problems x Javadoc Declaration Progress
    No consoles to display at this time.
```

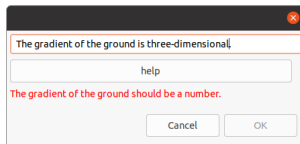
RoboWorld Document: select sentence type



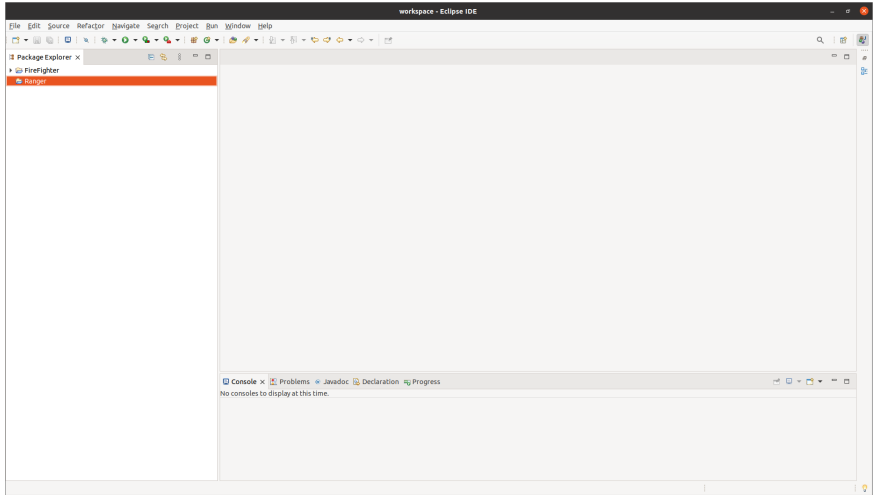
RoboWorld Document: parsing errors (supported by RGL)



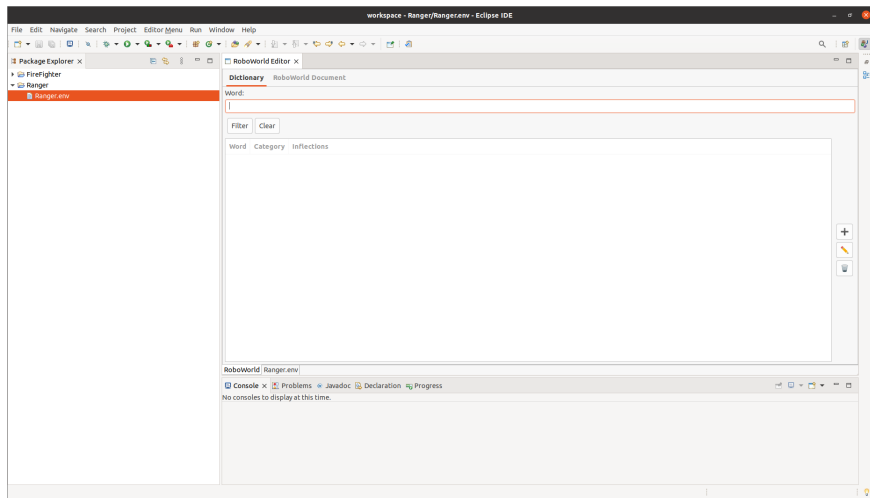
RoboWorld Document: well-formedness conditions



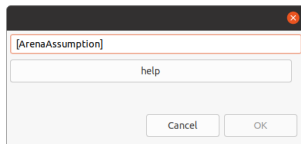
New General Project (name = Ranger)



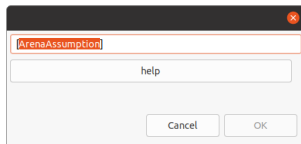
New File (name = Ranger.env)



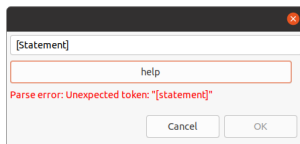
New Arena Assumption



New Arena Assumption (writing guidance)



New Arena Assumption (writing guidance)



New Arena Assumption (writing guidance)

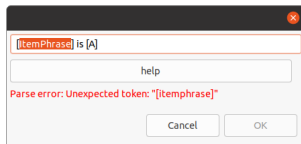
Select the option to be used

create Statement (ActiveVoice ToBe ItemPhrase) : ItemPhrase -> ItemPhrase -> Statement
create Statement (ActiveVoice AdverbFromAdjective ToBe Preposition ItemPhrase) : A -> ItemPhrase -> Prep -> ItemPhrase -> Statement
create Statement (ActiveVoice Modal TransitiveVerb DirectObject) : ItemPhrase -> VV -> V2 -> ItemPhrase -> Statement
create Statement (ActiveVoice Modal TransitiveVerb Prep DirectObject) : ItemPhrase -> VV -> V2 -> Prep -> ItemPhrase -> Statement
create Statement (ActiveVoice Negative Progressive IntransitiveVerb) : ItemPhrase -> V -> Statement
create Statement (ActiveVoice Negative Progressive TransitiveVerb DirectObject) : ItemPhrase -> V2 -> ItemPhrase -> Statement
create Statement (ActiveVoice Positive Progressive IntransitiveVerb) : ItemPhrase -> V -> Statement
create Statement (ActiveVoice Positive Progressive TransitiveVerb DirectObject) : ItemPhrase -> V2 -> ItemPhrase -> Statement
create Statement (ActiveVoice ToBe Adjective) : ItemPhrase -> A -> Statement
create Statement (ActiveVoice ToBe Conj Adjective Adjective) : ItemPhrase -> Conj -> A -> A -> Statement
create Statement (ActiveVoice ToBe Negative Comparison ItemPhrase) : ItemPhrase -> A -> ItemPhrase -> Statement
create Statement (ActiveVoice ToBe Positive Comparison ItemPhrase) : ItemPhrase -> A -> ItemPhrase -> Statement
create Statement (ActiveVoice ToBe Preposition ItemPhrase) : ItemPhrase -> Prep -> ItemPhrase -> Statement
create Statement (ActiveVoice TransitiveVerb DirectObject) : ItemPhrase -> V2 -> ItemPhrase -> Statement
create Statement (PassiveVoice IntransitiveVerb) : ItemPhrase -> V -> Statement
create Statement (PassiveVoice TransitiveVerb Preposition ItemPhrase) : ItemPhrase -> V2 -> Prep -> ItemPhrase -> Statement
create Statement (PastTense ActiveVoice TransitiveVerb Preposition ItemPhrase) : ItemPhrase -> V -> Prep -> ItemPhrase -> Statement
create Statement (PastTense PassiveVoice TransitiveVerb Preposition ItemPhrase) : ItemPhrase -> V -> Prep -> ItemPhrase -> Statement

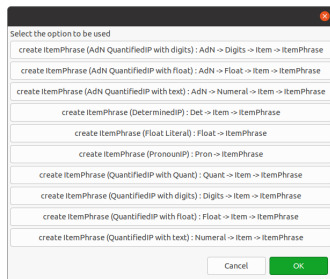
Cancel OK

Select: `create Statement (ActiveVoice ToBe Adjective) : ItemPhrase -> A -> Statement`

New Arena Assumption (writing guidance)

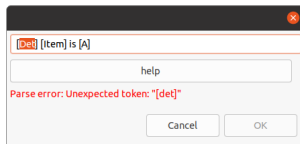


New Arena Assumption (writing guidance)

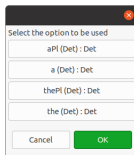


Select: create ItemPhrase (DeterminedIP) : Det -> Item -> ItemPhrase

New Arena Assumption (writing guidance)

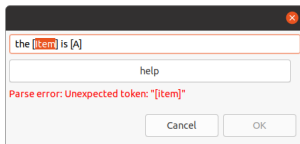


New Arena Assumption (writing guidance)

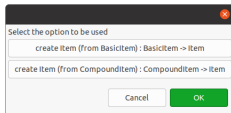


Select: **the (Det) : Det**

New Arena Assumption (writing guidance)

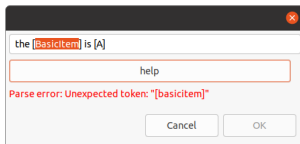


New Arena Assumption (writing guidance)

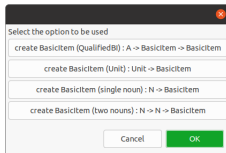


Select: create Item (from BasicItem) : BasicItem -> Item

New Arena Assumption (writing guidance)

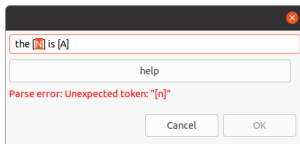


New Arena Assumption (writing guidance)



Select: `create BasicItem (single noun) : N -> BasicItem`

New Arena Assumption (writing guidance)



New Arena Assumption (writing guidance)



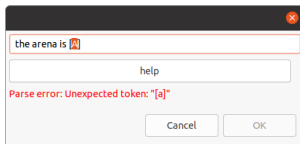
Select the option to be used

- arena (N) : N
- depth (N) : N
- diagram (N) : N
- direction (N) : N
- distance (N) : N
- event (N) : N
- gradient (N) : N
- ground (N) : N
- height (N) : N
- magnitude (N) : N
- mass (N) : N
- obstacle (N) : N
- operation (N) : N
- orientation (N) : N
- output (N) : N
- point (N) : N
- region (N) : N
- robot (N) : N
- speed (N) : N
- time (N) : N
- unit (N) : N
- value (N) : N
- velocity (N) : N
- width (N) : N


Cancel OK

Select: arena (N) : N

New Arena Assumption (writing guidance)



New Arena Assumption (writing guidance)

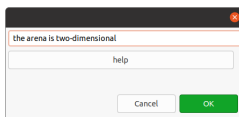


A dialog box with a dark header bar containing a red 'X' icon. The title is 'Select the option to be used'. Below the title is a list of eight options, each in a light gray box with rounded corners. The options are: 'angular (A) : A', 'available (A) : A', 'great (A) : A', 'initial (A) : A', 'less (than A) : A', 'one (dimensional A) : A', 'three (dimensional A) : A', and 'two (dimensional A) : A'. At the bottom of the dialog are two buttons: 'Cancel' and 'OK'.

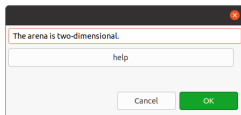
Select the option to be used	
angular (A) : A	
available (A) : A	
great (A) : A	
initial (A) : A	
less (than A) : A	
one (dimensional A) : A	
three (dimensional A) : A	
two (dimensional A) : A	
Cancel	OK

Select: two (dimensional A) : A

New Arena Assumption (writing guidance)

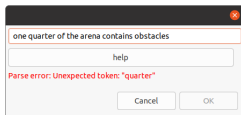


New Arena Assumption (writing guidance)



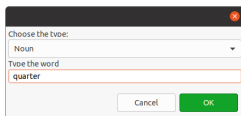
Case insensitive + Full stop

New Element Assumption



one quarter of the arena contains obstacles

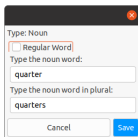
Adding words to the dictionary



A small dialog box with a dark gray title bar and a red close button in the top right corner. The dialog contains the following elements:

- A label "Choose the type:" followed by a dropdown menu showing "Noun".
- A label "Type the word" followed by a text input field containing the word "quarter".
- Two buttons at the bottom: a "Cancel" button and a green "OK" button.

Adding words to the dictionary



Type: Noun

☐ Regular Word

Type the noun word:

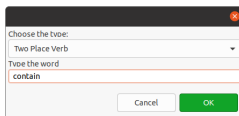
quarter

Type the noun word in plural:

quarters

Cancel Save

Adding words to the dictionary



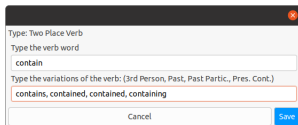
A small dialog box with a dark gray title bar and a red close button in the top right corner. The dialog contains two sections: 'Choose the type:' with a dropdown menu showing 'Two Place Verb', and 'Type the word' with a text input field containing the word 'contain'. At the bottom, there are two buttons: 'Cancel' and 'OK'.

Choose the type:
Two Place Verb

Type the word
contain

Cancel OK

Adding words to the dictionary



A screenshot of a web form titled "Type: Two Place Verb". The form has a title bar with a close button. It contains three input fields: "Type the verb word" with the value "contain", "Type the variations of the verb: (3rd Person, Past, Past Partic., Pres. Cont.)" with the value "contains, contained, contained, containing", and a "Cancel" button. A "Save" button is located at the bottom right of the form.

Type: Two Place Verb

Type the verb word

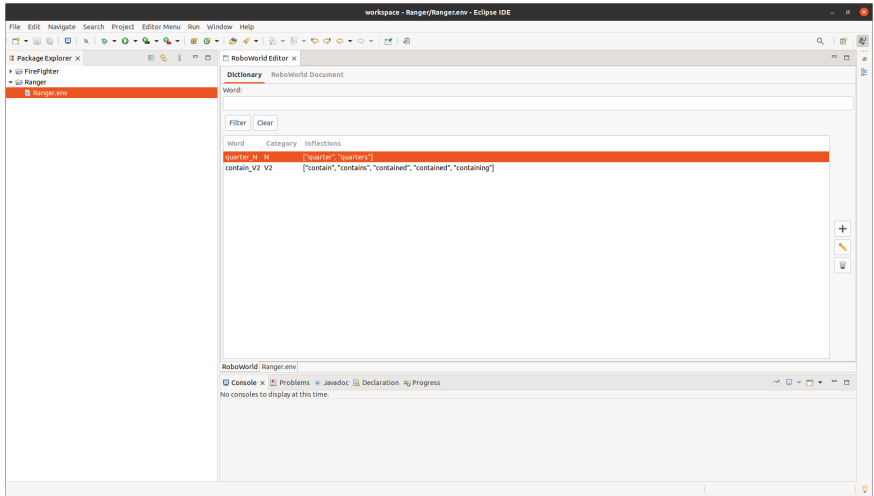
contain

Type the variations of the verb: (3rd Person, Past, Past Partic., Pres. Cont.)

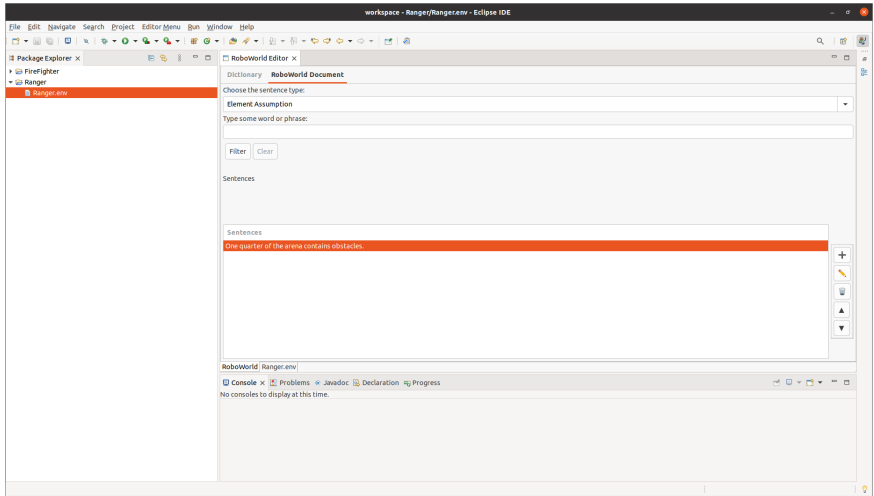
contains, contained, contained, containing

Cancel Save

Adding words to the dictionary



New Element Assumption



RoboWorld document: formal semantics

- ▶ Currently: discretised semantics based on CSP
(not available in this version of the tool)
- ▶ Work in progress: continuous semantics based on CyPhyCircus
(next lecture by Dr. James Baxter – after practical session)

Outline

- ▶ Demonstration (10 min)
- ▶ **Break**
- ▶ Practical session (20 min)

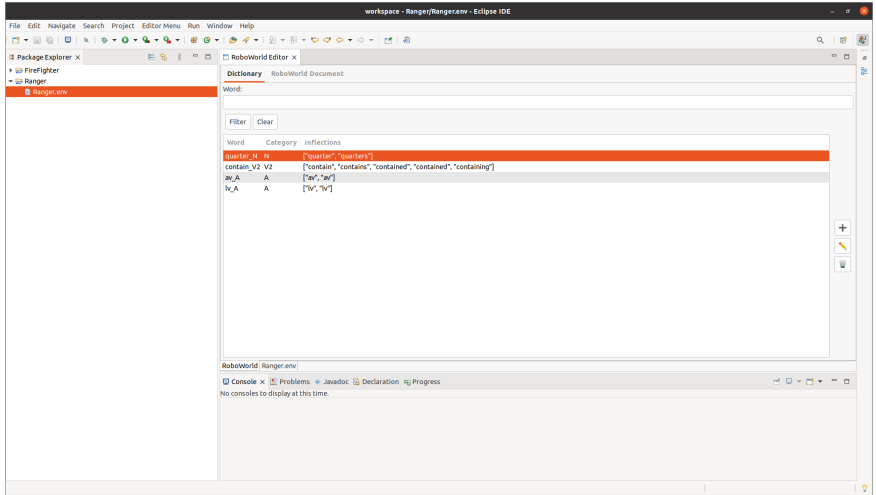
Outline

- ▶ Demonstration (10 min)
- ▶ Break
- ▶ **Practical session** (20 min)

Practical session: part #1

- ▶ Create a new General Project (name = Ranger)
- ▶ Create a new File (name = Ranger.env)
- ▶ Populate its dictionary
 - ▶ Noun: quarter
 - ▶ Two Place verb: contain
(variations = contains, contained, contained, containing)
 - ▶ Adjective: av
(variation = av)
 - ▶ Adjective: lv
(variation = lv)

Practical session: part #1 (solution)



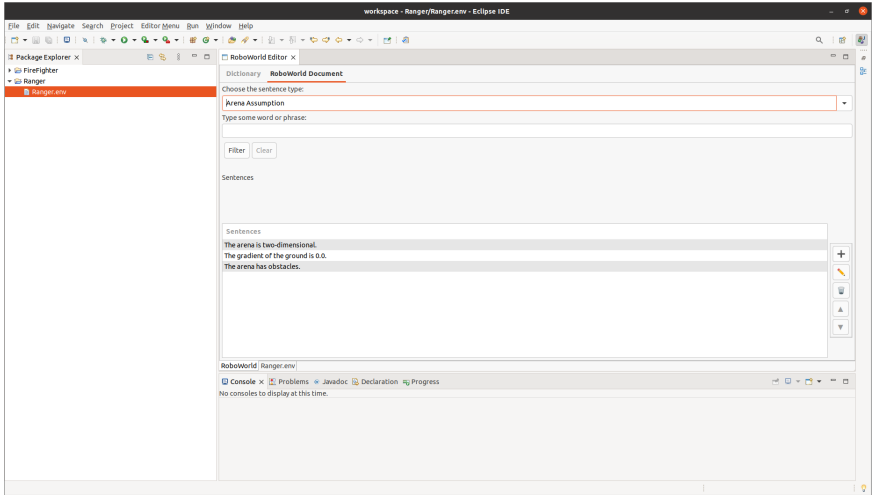
Practical session: part #2

- ▶ Copy&Paste these sentences (do not use the raw editor)
 - ▶ Arena Assumptions
 - ▶ The arena is two-dimensional.
 - ▶ The gradient of the ground is 0.0.
 - ▶ The arena has obstacles.
 - ▶ Robot Assumptions
 - ▶ The robot is a point mass.
 - ▶ Element Assumptions
 - ▶ One quarter of the arena contains obstacles.
 - ▶ The obstacles are point masses.

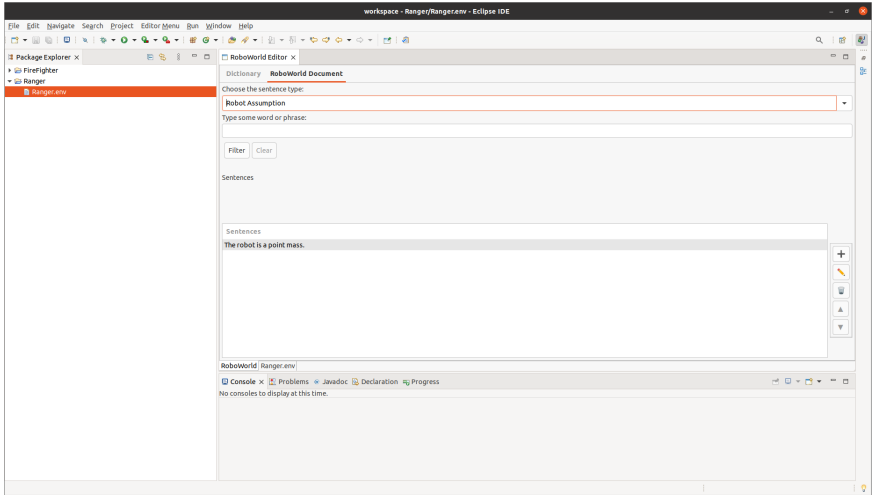
Practical session: part #2

- ▶ Copy&Paste these sentences (do not use the raw editor)
 - ▶ Mapping of Input Events
 - ▶ The event obstacle occurs when the distance from the robot to an obstacle is less than 0.5 m.
 - ▶ Mapping of Output Events
 - ▶ Mapping of Operations
 - ▶ When the operation `move(lv,av)` is called the velocity of the robot is set to `lv` m/s in the direction of the orientation of the robot and the angular velocity of the robot is set to `av` rad/s.
 - ▶ Mapping of Variables

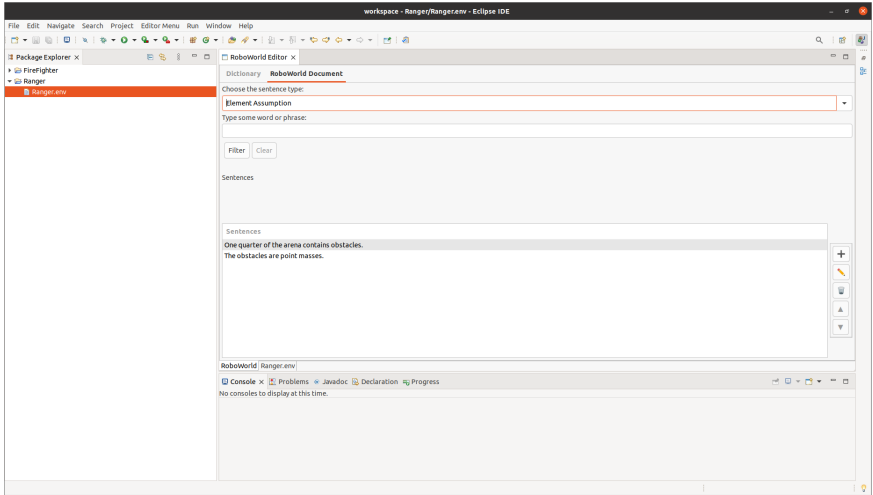
Practical session: part #2 (solution)



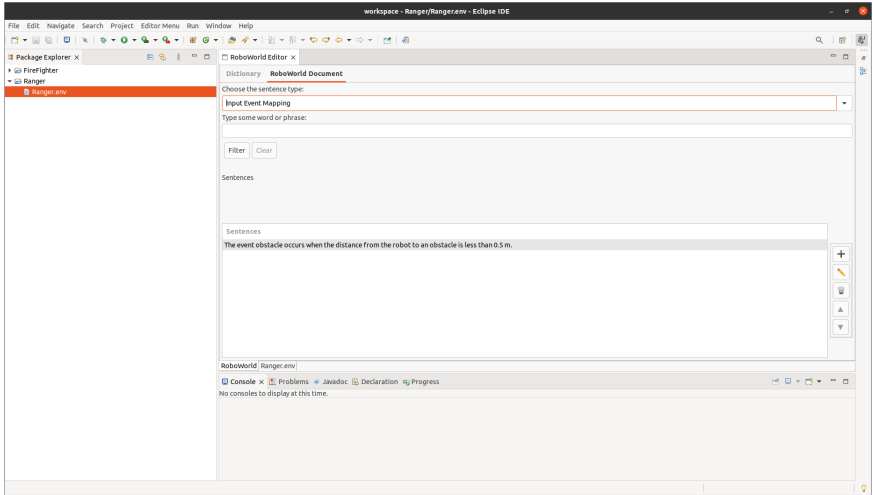
Practical session: part #2 (solution)



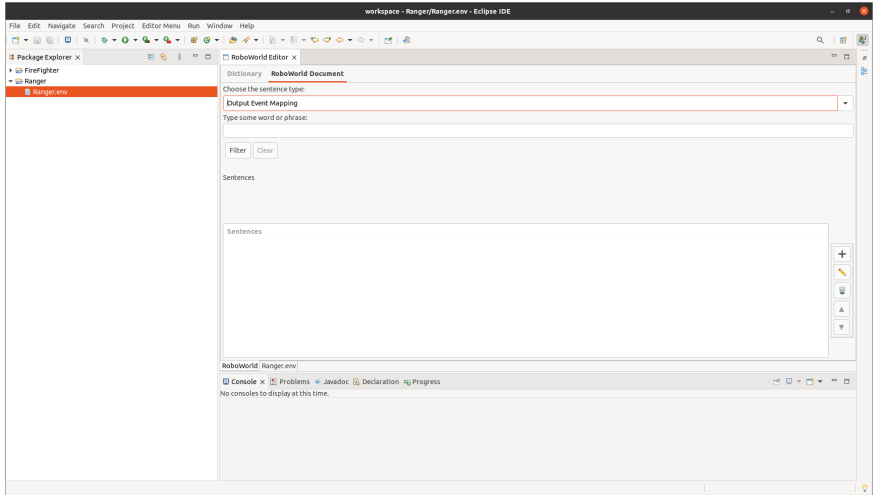
Practical session: part #2 (solution)



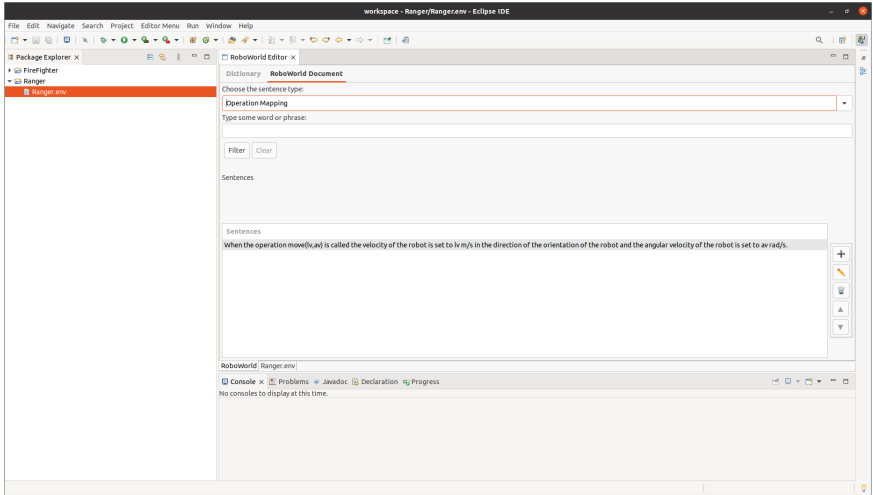
Practical session: part #2 (solution)



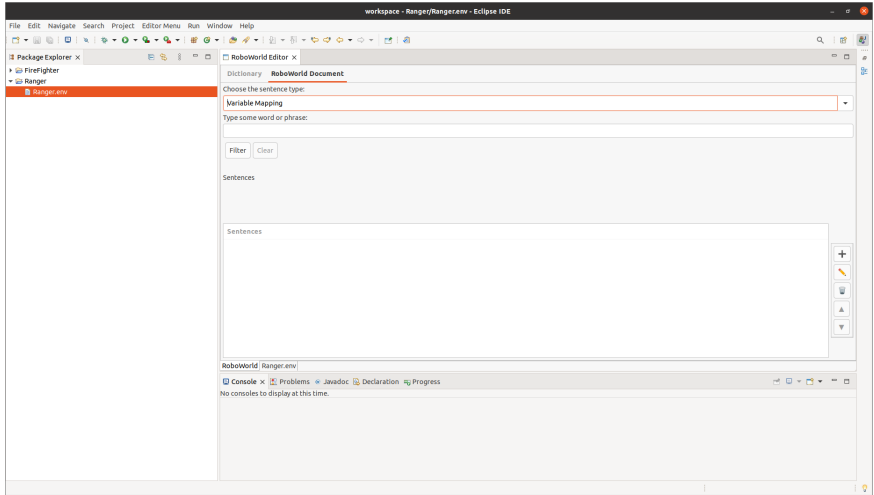
Practical session: part #2 (solution)



Practical session: part #2 (solution)



Practical session: part #2 (solution)



Practical session: going further (advanced)

- + Use the writing guidance to write the following sentence:
the arena is two-dimensional
- ++ Use the writing guidance to write the following sentence:
the gradient of the ground is 0.0
- +++ Inspect the files generated by the RoboWorld plugin
 - ▶ Ranger.gf: abstract grammar (project specific)
 - ▶ RangerEng.gf: concrete grammar (project specific)
 - ▶ RoboWorld.gf: abstract grammar
 - ▶ RoboWorldEng.gf: concrete grammar
 - ▶ RoboWorldLexicon.gf: abstract grammar
 - ▶ RoboWorldLexiconEng.gf: concrete grammar

(RoboStar Framework) RoboWorld in RoboTool

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19th of August, 2022

