HOW TO BUILD A SOFTWARE AGENT?

Lab. session 2 – November 5 2020.

Ph.D. Esteban Guerrero
esteban@cs.umu.se
INTERACTIVITY IN SMART ENVIRONMENTS 2020
QUESTIONS?
BEFORE START...

- Any question about the lecture?
- Any suggestion or petition?

Go to www.menti.com and use the code 63 46 25 7
ENGINEERING AGENTS
TOOLS FOR BUILDING AGENT’S MODULES

This lecture focus
TOOLS FOR BUILDING AGENT’S MODULES

Environment

Percepts

Actions

Sensors

Agents

Effectors

Depends on the problem. Tools selection depends on ways to solve that problem.
<table>
<thead>
<tr>
<th>BDI Frameworks</th>
<th>Specialized tools/sw</th>
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<tbody>
<tr>
<td>• JADE (Java Agent Development)</td>
<td>• Comercial AI-based tools: Amazon aws, Google AI, Facebook AI, IBM Watson, Microsoft Azure AI, etc.</td>
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<tr>
<td>• JaCaMo</td>
<td>• Open source</td>
</tr>
<tr>
<td>(Jason, Cartago, Moise)</td>
<td>• <strong>Python:</strong> nltk, OpenCV, pandas, OpenAI Gym, etc.</td>
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<tr>
<td>• Jason</td>
<td>• <strong>Java</strong> libraries: Caffe, Deeplearning4J, etc.</td>
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<tr>
<td>• Jack</td>
<td>• <strong>R</strong> packages: scikit-learn, DataExplorer, MLR, parsnip, Ranger, purrr, etc.</td>
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<tr>
<td>• JS-son</td>
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<tr>
<td>• ROS (Robot Operating System)</td>
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</tbody>
</table>
TOOLS (BDI FRAMEWORKS)

- JADE (Java Agent DEvelopment Framework)
- Jason
- JaCaMo
- JS-son
- ...

Platform: message delivery
Containers: agents home (e.g. A1,A4,etc.)
Communication protocol: Agent Communication Language (ACL)
AMS: the authority of the platform
DF: yellow pages (public board of services)
TOOLS (BDI FRAMEWORKS)

JaCaMo=Jason for programming autonomous agents +
Cartago for programming environment artifacts +
Moise for programming multi-agent organisations

http://jacamo.sourceforge.net/

CArtAgO: Common ARTifact infrastructure for AGents Open environments
Moise: Model of Organization for multi-agent SystEms
Jason: Java-based Agentspeak interpreter used with Saci for multi-agent distribution Over the Net
TOOLS (BDI FRAMEWORKS)

Jason

**by perception**

beliefs annotated with `source(percept)` are automatically updated accordingly to the perception of the agent

**by intention**

the operators `+` and `-` can be used to add and remove beliefs annotated with `source(self)`

```
+lier(alice); // adds `lier(alice)`[source(self)]
-lier(john); // removes `lier(john)`[source(self)]
+-lier(john); // updates `lier(john)`[source(self)]
```

**Types of goals**

- Achievement goal: `goal` *to do*
- Test goal: `goal` *to know*

**Syntax**

Goals have the same syntax as beliefs, but are prefixed by `!` (achievement goal) or `?` (test goal)

**Example (initial goal of agent Tom)**

```
!write(book).
```

An AgentSpeak plan has the following general structure:

```
triggering_event : context <- body.
```
TOOLS (BDI FRAMEWORKS)

Cartago

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JACAMO DEMO

Demo: JaCaMo multi-agents
KNOWLEDGE GRAPH CREATION
THE AGENT’S KNOWLEDGE

Information about the environment is updated

Environment

Agent

Sensors

Actions

Actuators

PHYSICAL SPACE

VIRTUAL SPACE

SPACE

SOFTWARE

AGENT

NON-HUMAN ACTOR

BODY

HUMAN ACTOR

ACTOR

DESIRE

BELIEF

INTENTION

ROLE

ACTION

ACTIVITY

OBJECT

OBJECTIVE

MENTAL OBJECT

PHYSICAL OBJECT

VIRTUAL OBJECT

hasLocation

uses

is-a

has

hasLocation

ConsistsOf

isDefinedBy

isToolIn

is-a

is-a

is-a

is-a
TOOLS (GOOGLE AI)

Demo: Google API vision

Sentiment/emotion analysis

Object analysis

Environment analysis

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TOOLS (GOOGLE AI)
WEB PROTÉGÉ
PROTÉGÉ VERSIONS
TASK 2
BUILDING A KNOWLEDGE BASE COLLABORATIVELY

Adding extra information about sensing
Make the first query
COLLABORATIVE TASK

Procedure:

• Split the group in Zoom rooms to form teams – randomly -

• Select a specific running example of a smart environment

  1. Examples: an older adult living at home with some specific needs (smart home environment), a tourist looking for specific city places with particular needs (smart city), a mixed reality pet that work as a companion of a person with specific needs (smart virtual environment), etc. – please imagine other scenarios

  1. Re-use the previous example - maybe

• Knowledge graph collaboratively building based on the example

  2. In the Zoom room one person opens the Zoom Whiteboard (Share Screen->Whiteboard-> Share)

  3. Create the taxonomy of entities (nodes) with relationships (is-a) using a color

  4. Create semantic relationships (e.g. has_pet, is_pet_of) with other color

  5. Add some individuals in other words, examples or instances of those entities with other color

  6. Add names of the group member in the top-left of the drawing

  7. Add a title to the graph, example: older adult smart environment graph, tourist smart city graph, etc.

• Save the drawing graph locally

  8. In Zoom click in Save on top of the Whiteboard

• Answer questions (next slide), take notes about those answers. Then present those answers.

• Time 10 minutes
COLLABORATIVE TASK

Alternatively, for sharing if Annotations and Whiteboard in Zoom is limited:

1. All the team members go to o365.umu.se/
2. Login with UmU credentials
3. One person creates and opens a new Whiteboard
4. Share the link of the new whiteboard with the other members via Zoom
5. Make the knowledge graph collaboratively
6. Save the graph
COLLABORATIVE TASK

Procedure:
- Open Web protégé: https://webprotege.stanford.edu/
- Create an account
- Create the taxonomy (the families of knowledge entities)

• Time 10 minutes
COLLABORATIVE TASK

Questions

• What information of the graph is necessary?
• What parts of the graph change on time (dynamic smart environment variables)?
• What information may be uncertain or incomplete?
• What sensors can be used to capture that information?
PRESENTATION OF THE RUNNING EXAMPLE AND KNOWLEDGE GRAPH
PRESENTATION OF EXAMPLE AND KNOWLEDGE GRAPH

Procedure:

• Join the main Zoom session
• Different members of the group present the running example.
• Others present the graph.
• Other the reflections

Time for every presentation 5-10 minutes
MORE EXAMPLES AND RESOURCES
EXAMPLES

Demo: KNIME example of an ontology, querying using SPARQL
THANK YOU