

BDI ARCHITECTURE

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BE4M36MAS - Multiagent systems

DISTANCE TEACHING

- If there is someone who cannot participate, tell us!
- Don't be afraid to ask
 - about things you don't understand,
 - about technical stuff – you can share your screen.
- Make use to it :)

Kids returning to school after Corona.



MODEL-BASED GOAL-BASED AGENTS

Model-based goal-based agents

How to implement them and get
actions from goals effectively?

BELIEF-DESIRE-INTENTION

WHAT IS IT?



Model for programming autonomous agents using three concepts:

- Beliefs → Model of the Environment of the Agent → Adjusted or Hard-coded
- Desires → Ultimate Goals of the Agent
- Intentions

BELIEFS

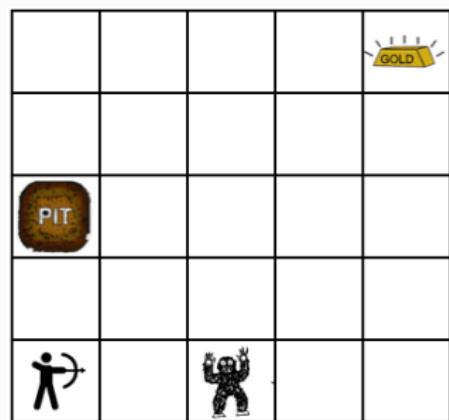
BELIEFS

~ agent's model of the world (what he supposes to be true)

Beliefs at start

Example:

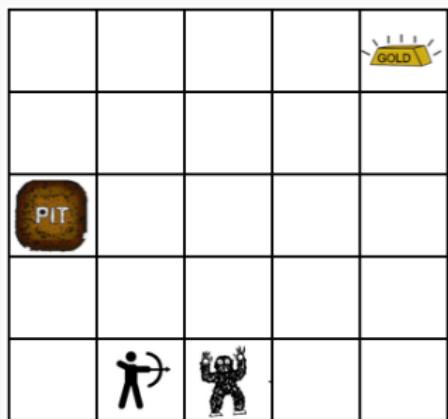
Agent knows there's gold in the game And there are no pits or monsters nearby



BELIEFS

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Example:



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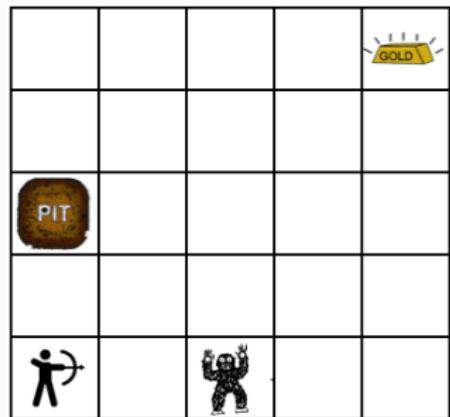
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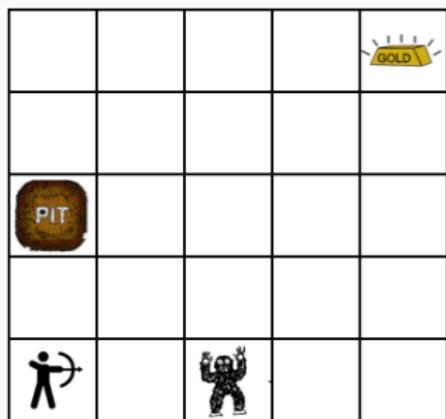
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Example: What are agent's beliefs?

SAME AS BEFORE. Ans:

Monster Near $(0, 1)$

Pit Near $(1, 0)$

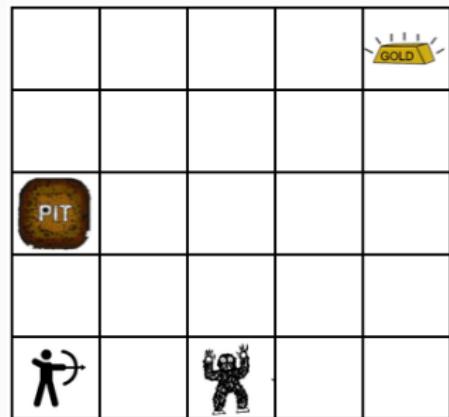


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Example: What are agent's beliefs?

```
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```



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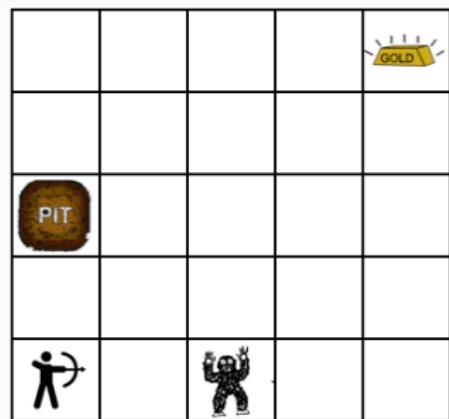
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Poll

menti.com Code: 99 88 38 2



Belief = Knowledge?

No!



Beliefs **are not** knowledge!

- An agent may **believe** facts that are **not true**.

Example:

Weather forecast announces nice weather for the weekend.

`nice_weather(sat). nice_weather(sun).`

→ You can believe that, but you cannot take it for granted.

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Example: Communication between agents

DESIRERS

~ state of the world agent is **dreaming** about

Agent need not succeed in achieving all his desires, e.g.:

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Example: Vacuum cleaner — what desires does the agent have?

- Agent wants to ~~sweep~~ ~~money~~
- Agent wants to eat



The desire the Agent has Comited And is currently
Trying to Achieve.

Agent Must believe is Possible

INTENTIONS

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- Agent **must believe** that it is possible to realize the intention.
- Intention do **persist**.
- Agent need **not intend** side effects

↳ doesn't take
into account side effects



PRACTICAL REASONING

How do we turn **desires** into
actions the agent performs?

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COMPONENTS OF PRACTICAL REASONING



What if Roomba finds out that cables prevents it from going to another room?

COMMITMENTS

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~ indicate that an agent has **committed** to some intention

Optional: Situation in which an agent may forget about his intention (i.e. **decommit**)

- Individual commitments
- Social commitments

- Blind commitment — the only way to decommit is to succeed
- Single-minded commitment — agent may decommit when he believes it is no longer possible to succeed
- Open-minded commitment — agent may decommit when he no longer believes it is possible to succeed

SM → Solo se ejecuta No hay Ningún Charle de Hacerlo

OM → A la primera Noticia define lo que va hacer el evento,
↳ ABANDONA

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- **Open-minded commitment** — Agent drops his intention as soon as the updated forecast is released.

INDIVIDUAL COMMITMENTS



IMPLEMENTING BDI

-
- Beliefs
 - Desires
 - Intentions

-
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 - Intentions
 - Events
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Agent responds to an event by executing appropriate **plan**

A plan has:

- **trigger** – what event (i.e., intention) it is able to handle
- **context** – under what circumstances the plan is applicable
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Example: Think of a plan for realizing !cleanup intention of a Roomba.

CURRENT AGENT PROGRAMMING

ARE MAS DEAD?

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Nope

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Nope

Then what is the difference?

ARE MAS DEAD?

Nope

Then what is the difference?

before: Purist Approach

now: **Pragmatic Approach**

STRICT VS PRACTICAL AGENT PROGRAMMING

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- **Languages:** Agent vs Standard
- **Sensors:** All Info from sensors vs Only meaningful sensors
- **Acting:** Everything is an Action vs Direct code execution

MULTI-AGENT EXAMPLES

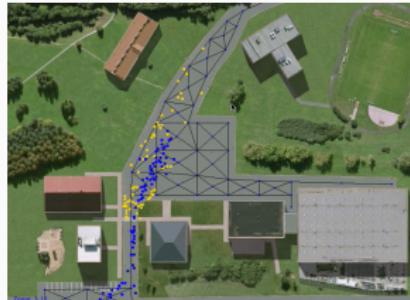
Multi-agent Traffic Simulation –
AgentPolis



FPS bots – **Pogamut**



Crowd Simulation **AgentCrowd**



NEXT TUTORIAL

Assignment of the 1st semestral project

If possible, bring your computer with working Java environment (JDK + IDE), please