Agent architectures

BE4M36MAS - Multiagent systems

Organization

Tutors

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Website:
`https://cw.fel.cvut.cz/wiki/courses/be4m36mas/start`

Tutorials

Attendance: **voluntary** (but tracked)

Assessment – 3 assignments:

1. Agent programming (max 11 pts)
2. Competitive game theory (max 17 pts)
3. Cooperative game theory (max 12 pts)

Plagiarism is strictly forbidden

(Strong punishments would be applied)

Agent architectures

Components of agent architectures

Components of agent architectures

Actions (A)

Ways for the agent to influence the environment

Percepts (P)

Observations about the state of the world

Decision making ($d : P^* \rightarrow A$)

Mapping perception history to actions

Architecture types

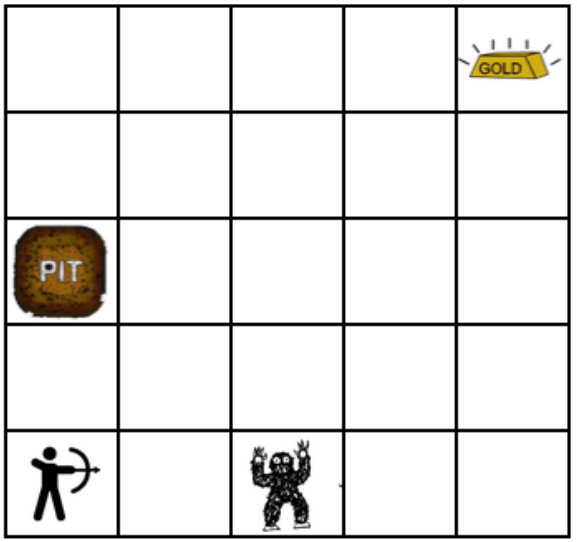
1. Reflex (reactive) Agent
2. Model-based Reflex Agent
3. Model-based Goal-based Agent
4. Model-based Utility-based Agent
5. Learning-based Agent

(Russell and Norvig)

Wumpus' World

Wumpus' World

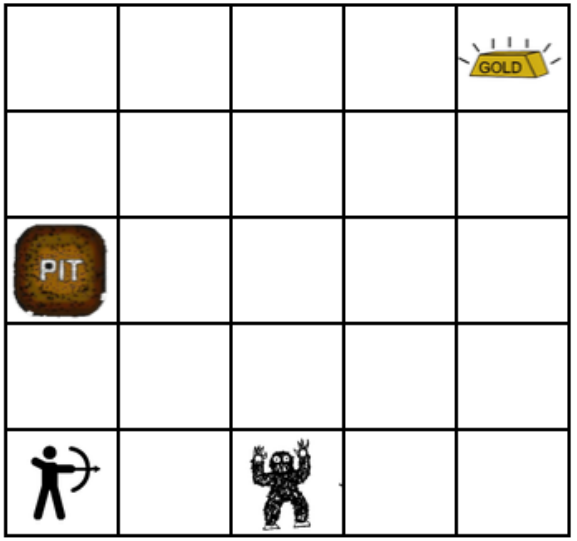
- Grid world environment
- Agent has to find the gold brick and carry it to the bottom left square
- Problem: Entering a square occupied by Wumpus or containing a pit costs agent his life (Wumpus does not move)



Wumpus' World

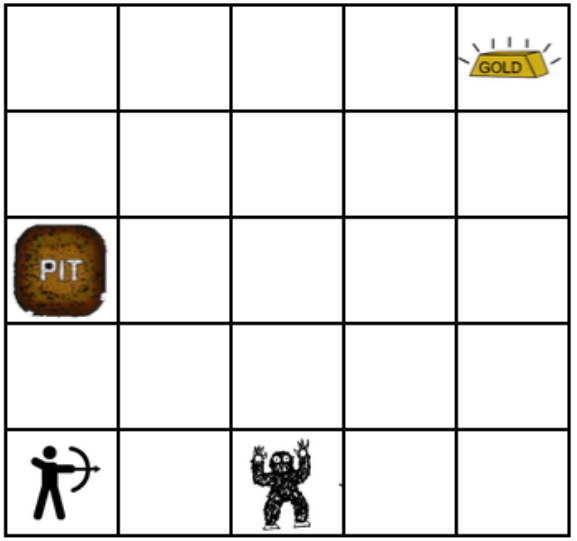
Wumpus' World — Percepts

- *Breeze* — whenever agent stands next to a pit
- *Stench* — whenever agent stands next to Wumpus
- *Gold* — when agent carries a gold brick



Wumpus' World — Actions

- Going to any neighboring square (only vertically and horizontally)



Reflex agent

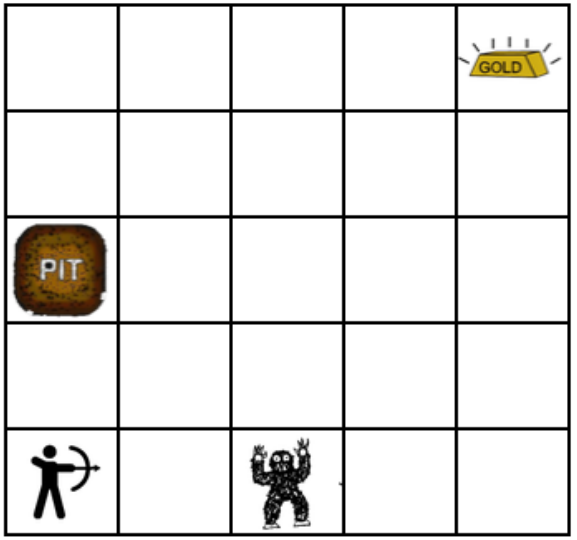
Agent conditions his decision solely on his **current** percepts.
(e.g. on the facts he can currently sense)

Task: Implement a reflex agent for Wumpus world. Beware, do not use any kind of memory or smarter reasoning ;-)

Model-based reflex agent

Agent uses percepts to gradually build a **model** of the environment.

Decisions are based on the expected state of the world according to his model.



Question: Does this approach allow us to overcome this issue?

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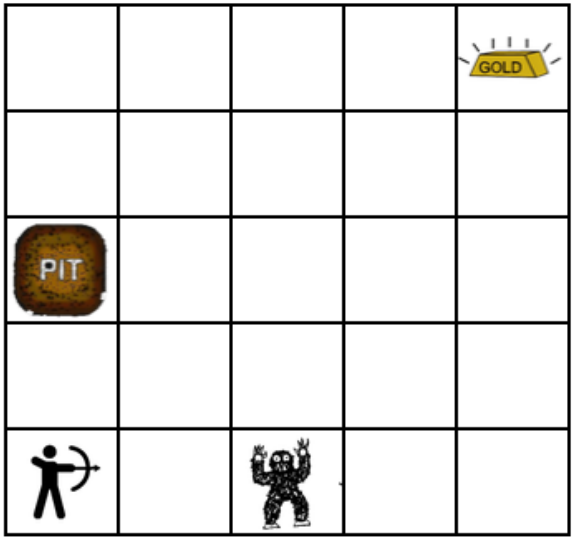

Question: Does this approach allow us to overcome this issue?

Task: Implement a model-based agent and reach the gold!

Model-based reflex agent

Question: Is the behaviour of the agent rational?

Model-based reflex agent

Question: Is the behaviour of the agent rational?

Definitely not!

Agent just exploits the model to stay alive. He does not intentionally pursue his goal.

Model-based Goal-based agent

Actions are chosen in order to reach a **declaratively** specified **goal**.

Techniques:

1. Planning — Planning in AI
2. Belief-Desire-Intention Architecture — this course

Question: What does it mean for an agent in Wumpus' world?

Model-based Utility-based agent

Not all ways to reach the goal are equally plausible. Some ways to reach the goal **should be prefered** against others.
(e.g. cheaper or less risky ones)

Utility driven sequential decision making:

- Non–adversarial: MDPs, POMDPs — Planning in AI
- Adversarial: Sequential games — this course

Learning-based agent

Agent **does not fully know** the task he is facing.
(what his action does, what is his goal etc.)

He **learns** the task on the go — strategy reflecting these finds cannot be fixed in advance.

Learning **both** model and strategy.

Next tutorial

Next tutorial

- Belief-Desire-Intention architecture