

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. Game theory (max 17 pts)
3. Distributed constraint satisfaction (12 pts)

AGENT ARCHITECTURES

COMPONENTS OF AGENT ARCHITECTURES

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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

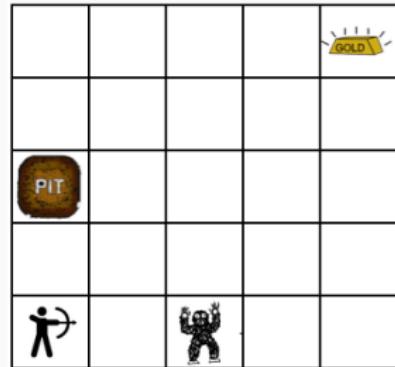
1. Reflex (reactive) Agent
2. Model-based Reflex Agent
3. Model-based Goal-based Agent
4. Model-based Utility-based Agent
5. Learning-based Agent

(Russell and Norvig)

WUMPUS' WORLD

Wumpus' World

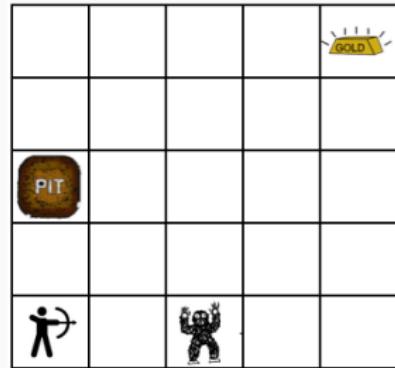
- Grid world environment
- Agent has to find the gold brick and carry it to the bottom left square
- Problem: Entering a square occupied by Wumpus or containing a pit costs agent his life
(Wumpus does not move)



WUMPUS' WORLD

Wumpus' World – Percepts

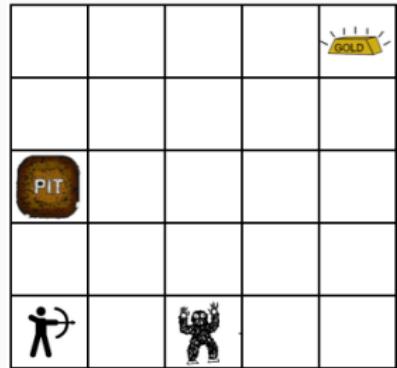
- *Breeze* — whenever agent stands next to a pit
- *Stench* — whenever agent stands next to Wumpus
- *Gold* — when agent carries a gold brick



WUMPUS' WORLD

Wumpus' World – Actions

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



REFLEX AGENT

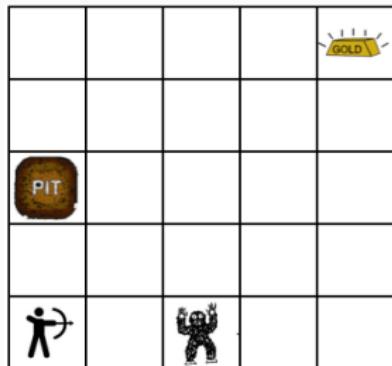
Agent conditions his decision solely on his **current** percepts.
(e.g. on the facts he can currently sense)

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.

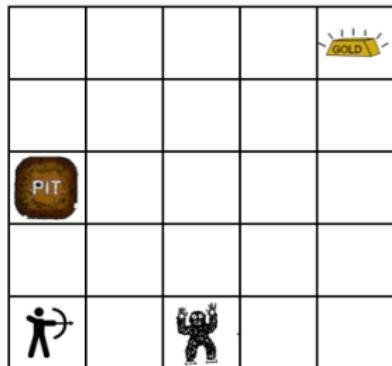


Question: Does this approach allow us to overcome this issue?

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



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 preferred** 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

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- Belief-Desire-Intention architecture