

# AGENT ARCHITECTURES

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BE4M36MAS - Multiagent systems

# ORGANIZATION

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<https://cw.fel.cvut.cz/wiki/courses/be4m36mas/start>

# AGENT ARCHITECTURES

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# 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

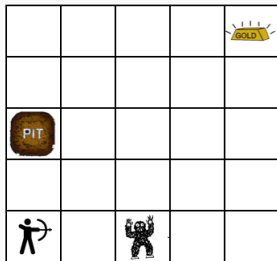
- *Breeze* — whenever agent stands next to a pit
- *Stench* — whenever agent stands next to Wumpus
- *Gold* — when agent carries a gold brick



# Wumpus' World

## Wumpus' World — Actions

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



# Reflex agent

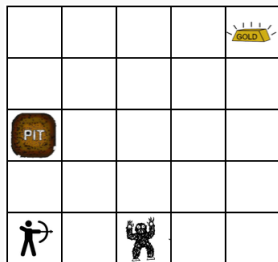
Agent conditions his decision solely on his **current** percepts.  
(e.g. on the facts he can currently sense)

*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.

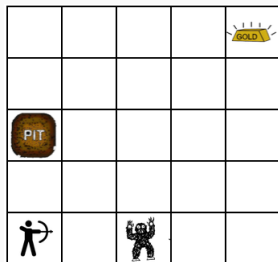


*Question: Does this approach allow us to overcome this issue?*

# 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?*

*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 and games
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 and games
- 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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## Next tutorial

- Belief-Desire-Intention architecture
- Programming in Jason (if possible, bring your computers)