

Artificial Intelligence Lab I: Agents

DT8042, HT2021, Halmstad University

Yuantao Fan

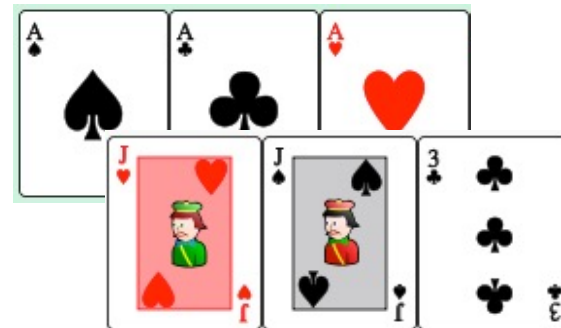
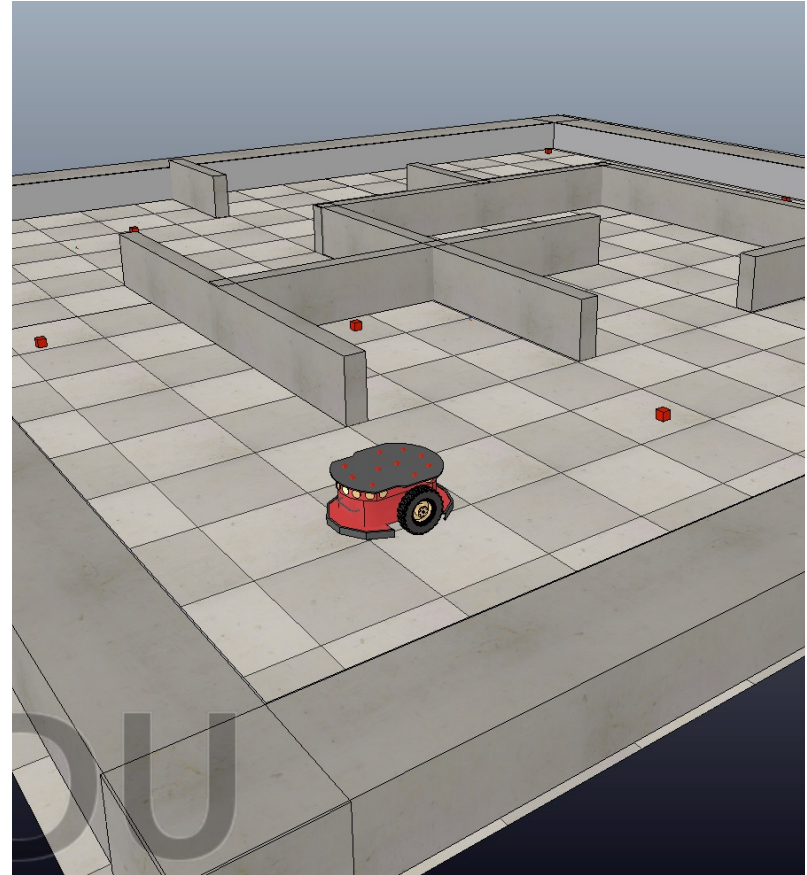
Nov 2021

General Information of the labs

- 4 Labs
 - Agents
 - Search algorithms
 - Bayesian Networks
 - Reinforcement Learning
- Lab activities (2 weeks per lab)
 - Introduction
 - Work/practice session
 - Q&A session
- Work in a group of 3 students
 - Randomly assigned group members
- Grading
 - Pass / fail
 - Extra credits
 - Late submission will be graded during re-examination period

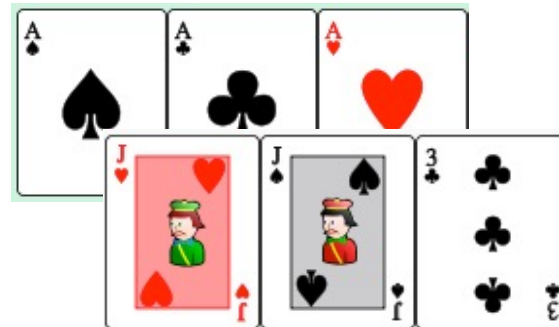
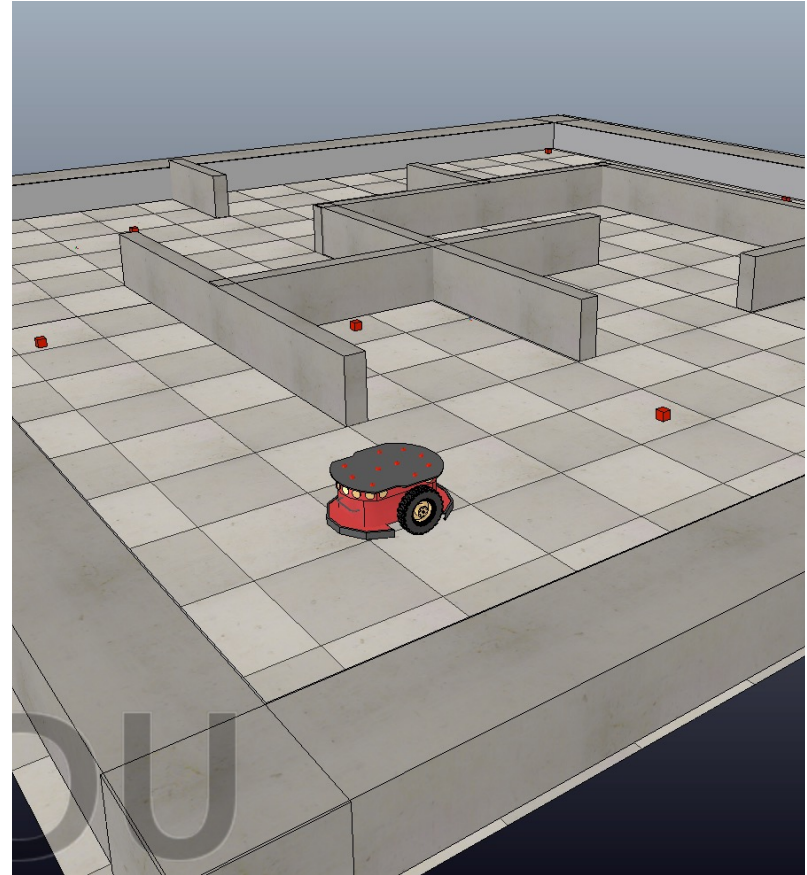
Lab I - Agents

- Mobile robot
 - Collect Energy
- Poker game player
 - Win more coins/games



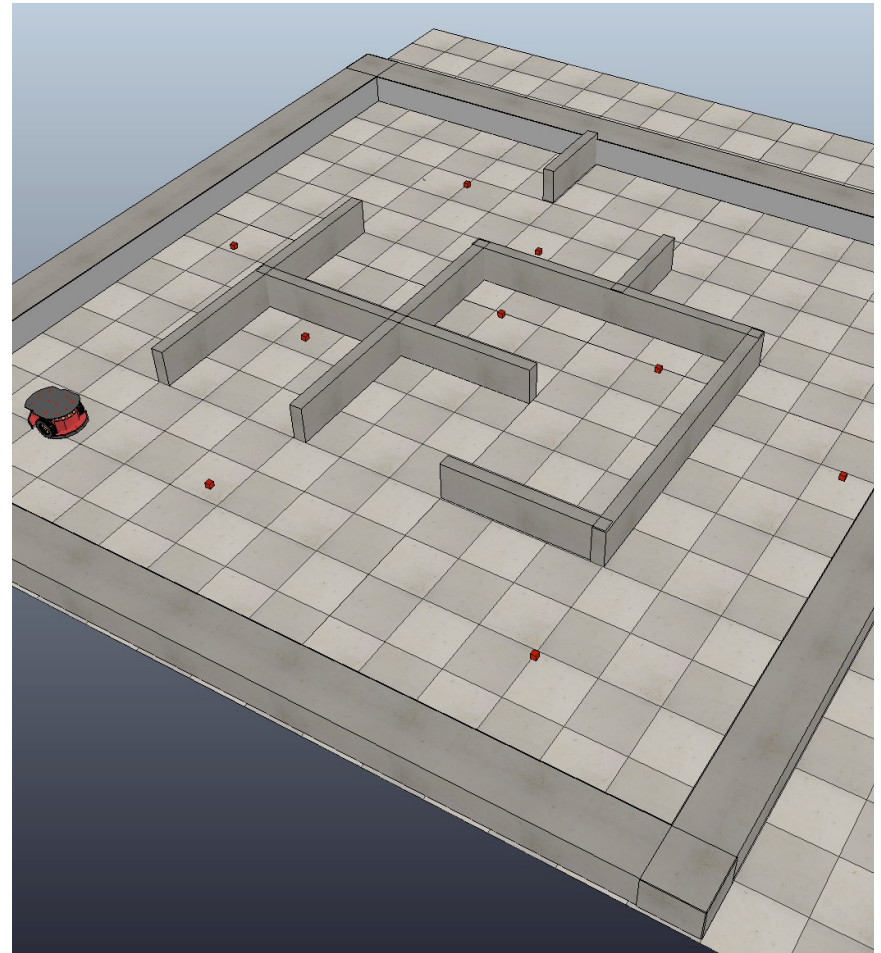
Lab I - Agents

- Random agent
- Fixed agent
- Reflex agent
- Agent with memory



Task I – Mobile robot

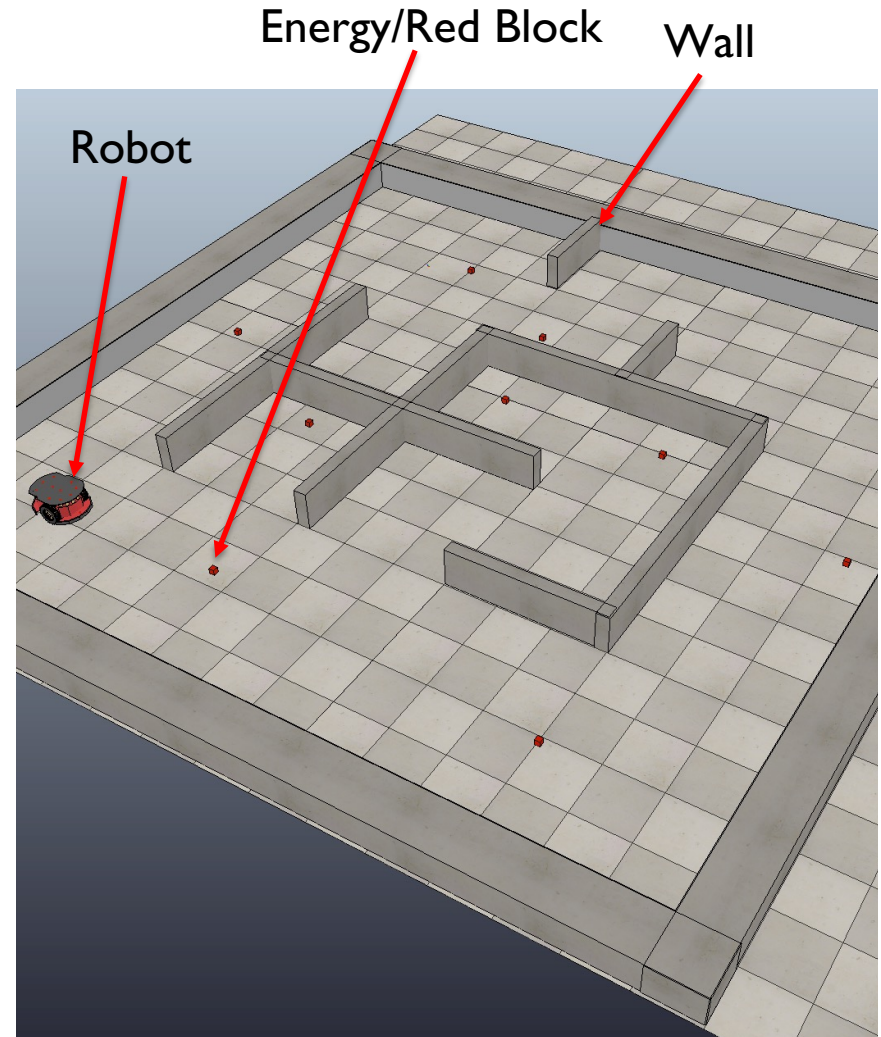
- Pioneer P3-DX as the agent
- The maze as the environment
- Collect energy blocks
- Avoid walls



Task I – Mobile robot

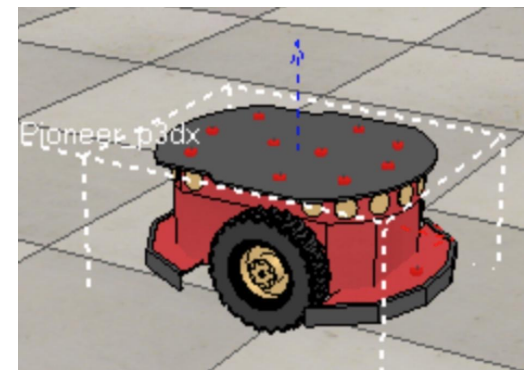
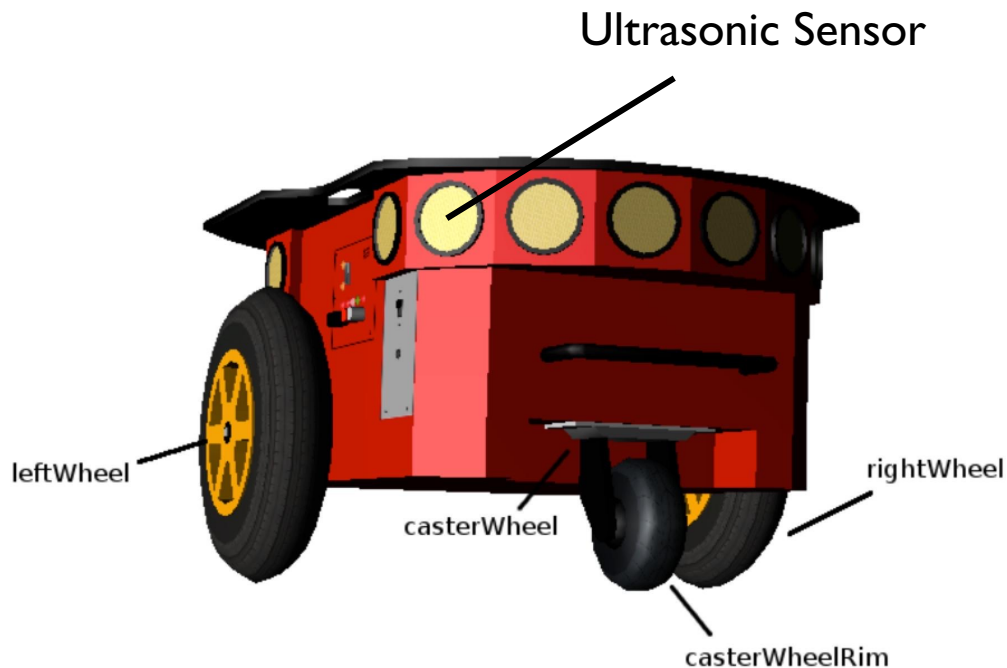
- Pioneer P3-DX as the agent
- The maze as the environment
- Collect energy blocks
- Avoid walls

PEAS description (performance measure, environment, actuators, sensors)



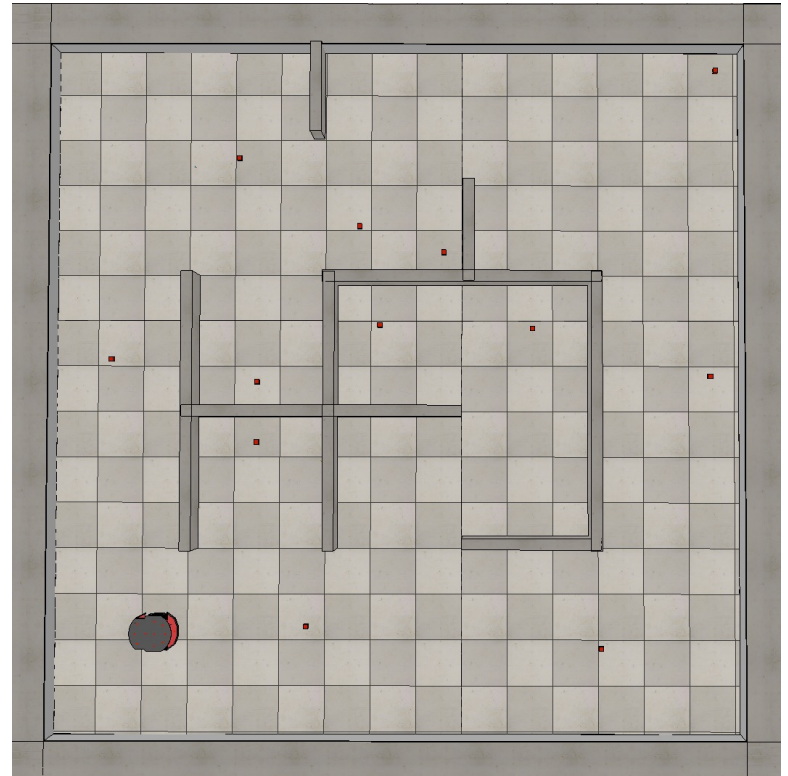
Task I – Mobile robot

- Pioneer P3-DX



Task I – Mobile robot

- Actions of the agent
 - Sensing
 - Energy detector
 - Distance sensors
 - Move from Point A to B
 - Collect energy
 - Avoid obstacles (walls)



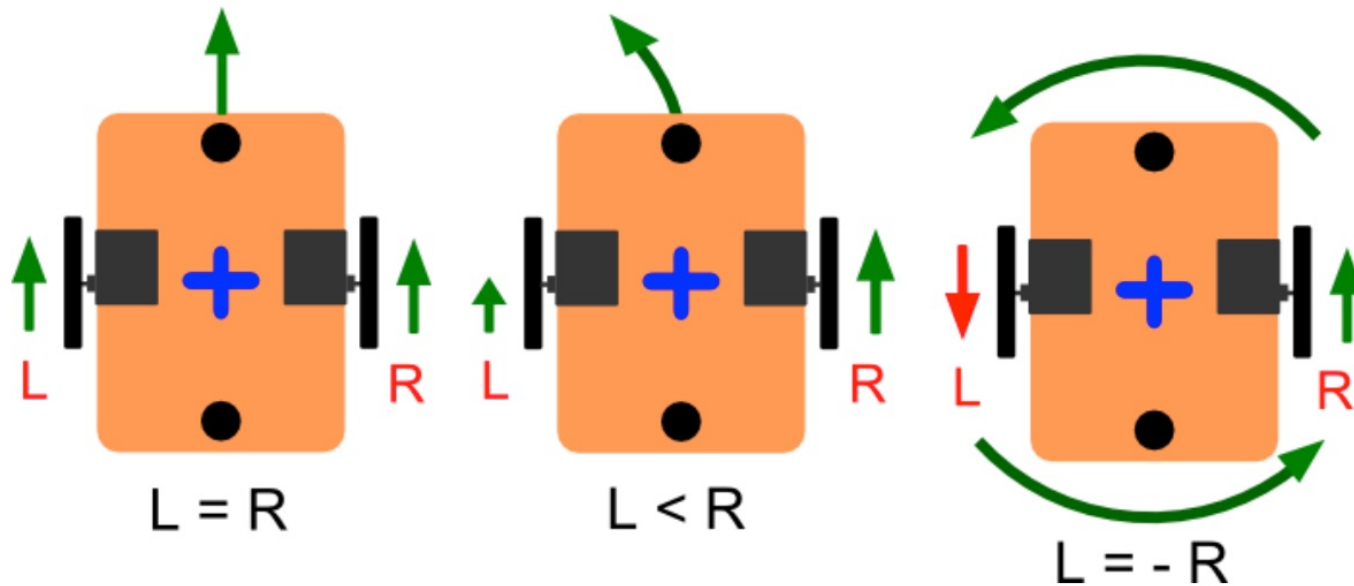
Task I – Mobile robot

- Actions of the agent
 - Sensing
 - Energy detector
 - Distance sensors
 - Move from Point A to B
 - Turn & march forward
 - Spline
 - Collect energy
 - Avoid obstacles (walls)



Task I – Mobile robot

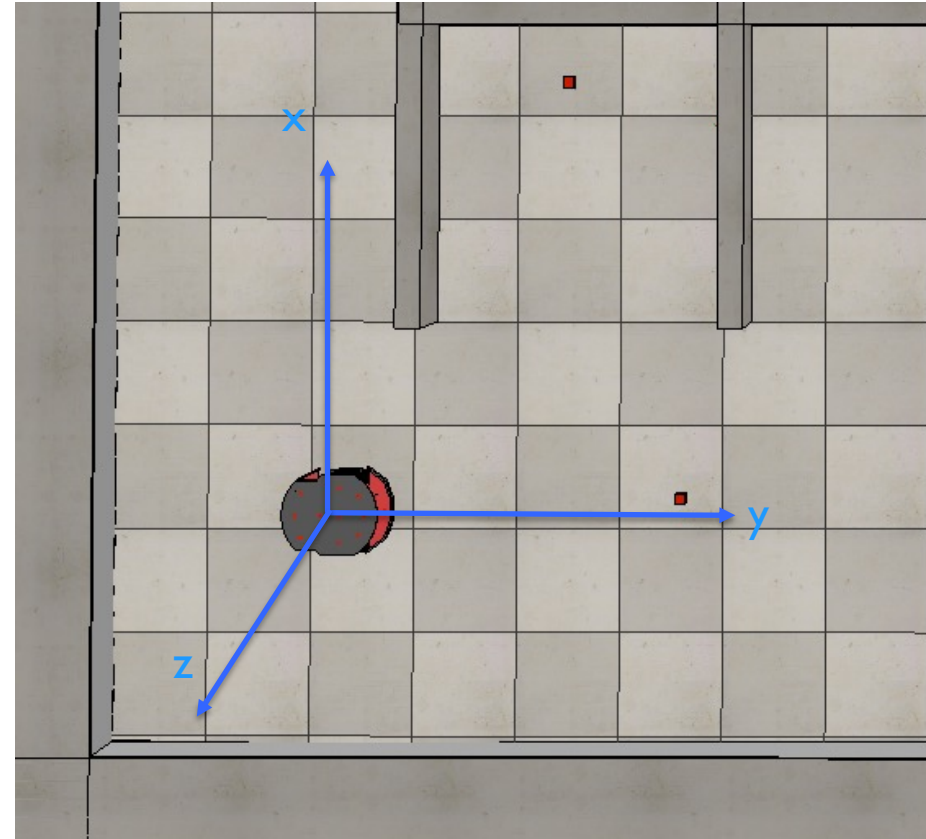
Pioneer P3-DX: Differential Drive



Task I – Mobile robot

Energy (red box) detector

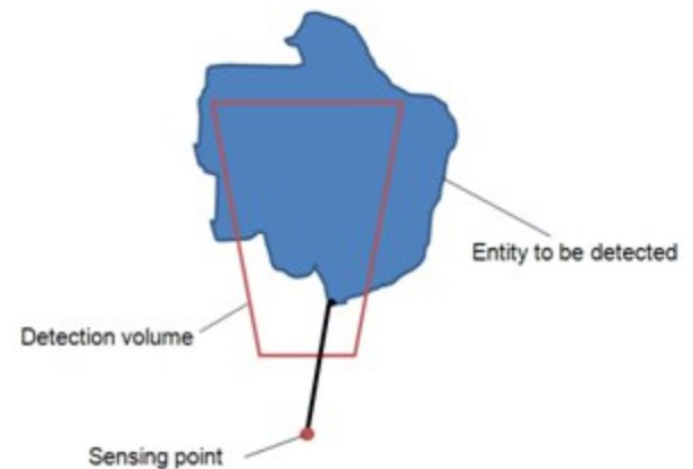
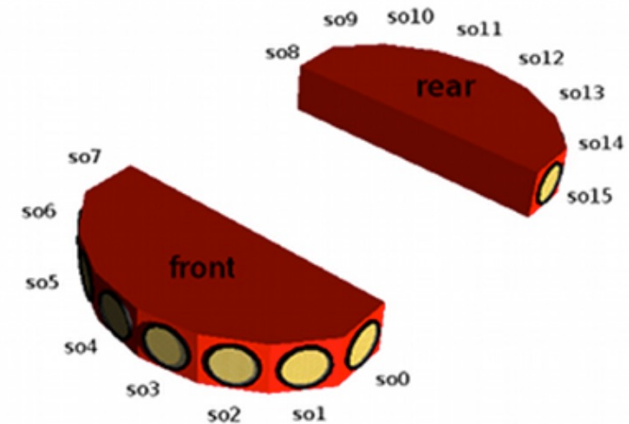
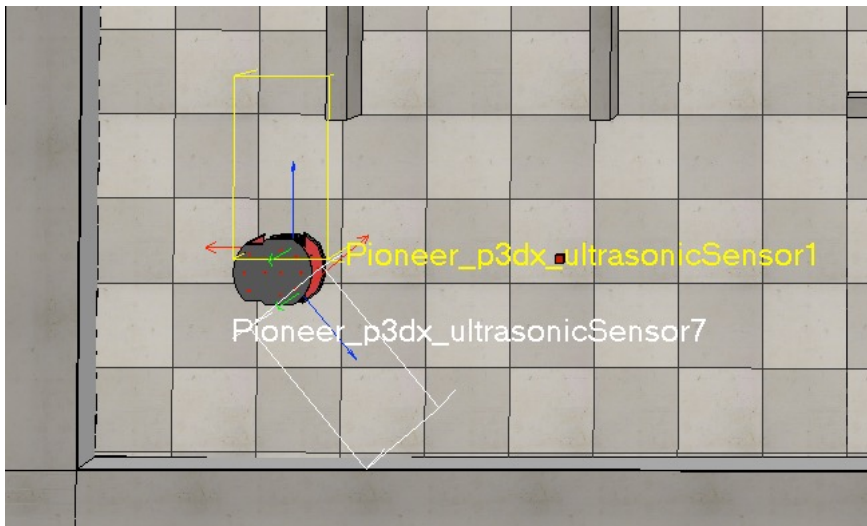
- Relative position to the robot
- E.g.
 - $(0.02, 3, 0)$
 - $(4.5, 2, 0)$



Task I – Mobile robot

Ultrasonic Sensor

- Distance to the object in the front



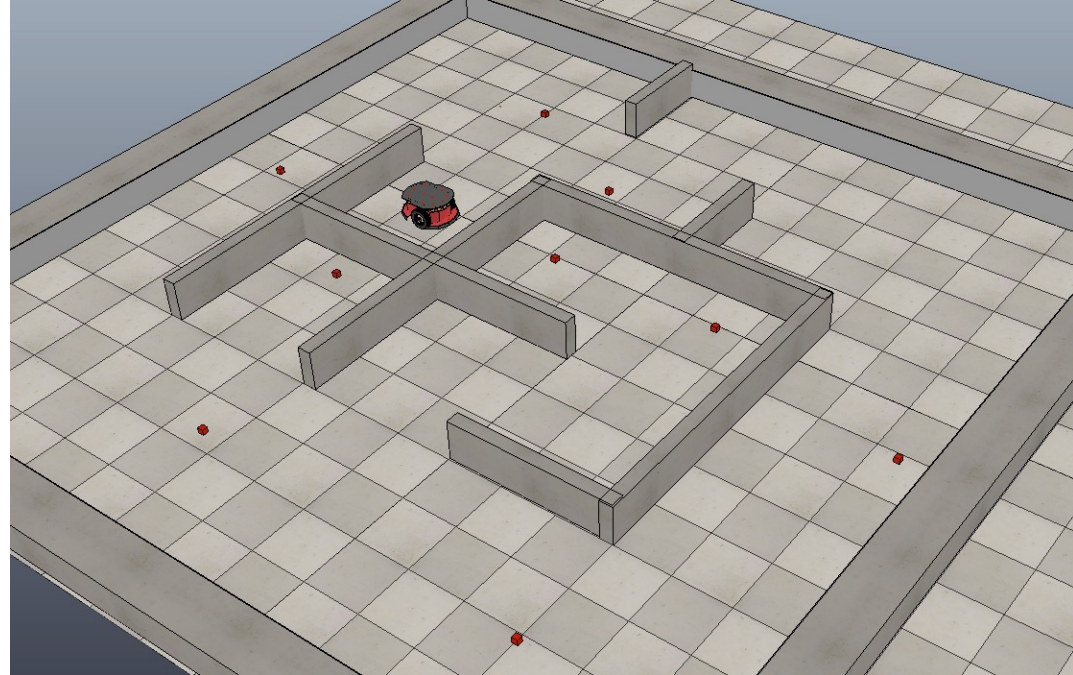
Task I – Mobile robot

- Actions of the agent
 - Sensing
 - Energy detector
 - Distance sensors
 - Move from Point A to B
 - Turn & march forward
 - Spline
 - Collect energy
 - Avoid obstacles (walls)



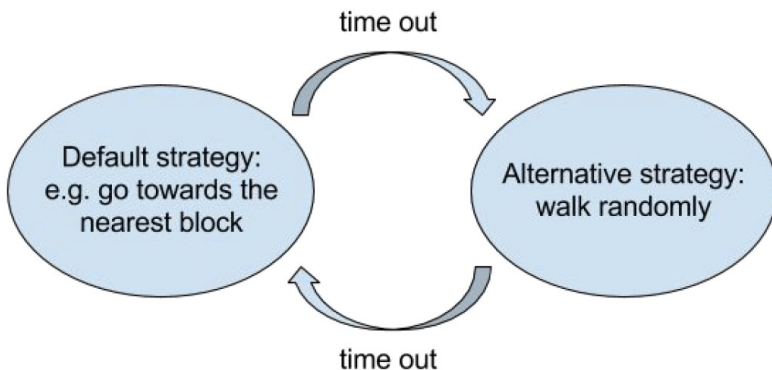
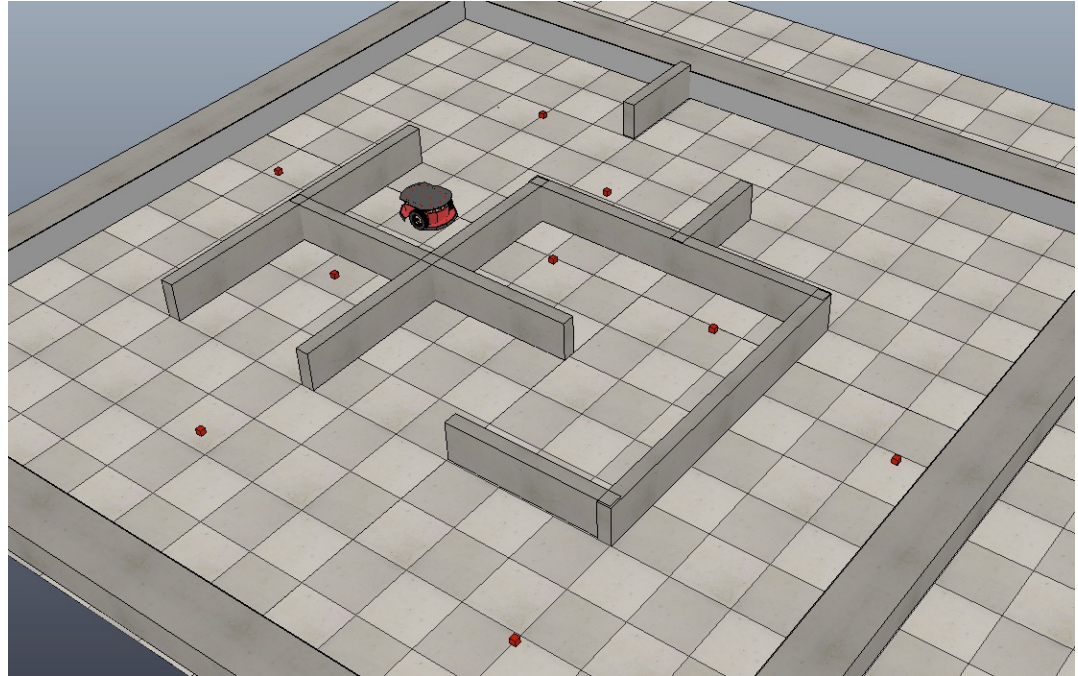
Tasks

- Random agent
- Fixed agent
 - 1-2 blocks
- Reflex agent
 - Sensor input
 - decision
- Agent with memory
 - Switch strategy



Tasks

- Random agent
- Fixed agent
 - 1-2 blocks
- Reflex agent
 - Sensor input
 - decision
- Agent with memory
 - Switch strategy

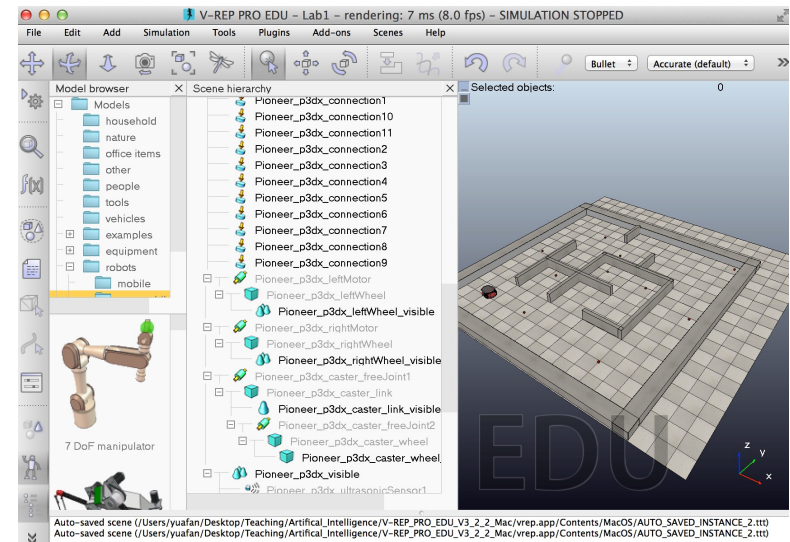


Tasks – useful functions

- “robot = World.init()”
- “vrep.simxGetObjectHandle(...)”
- “getSensorReading(...)”
- “setMotorSpeeds(...)”
- “execute(...)”
- “findEnergyBlocks()”
- “collectNearestBlock()”

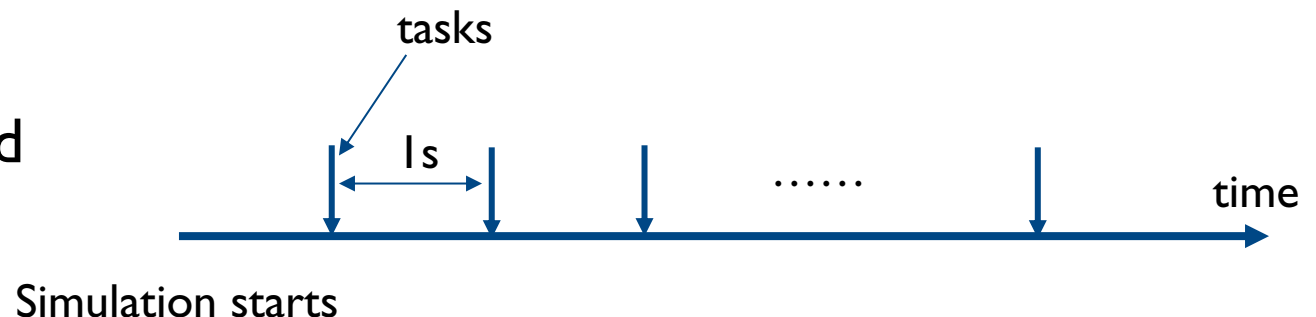
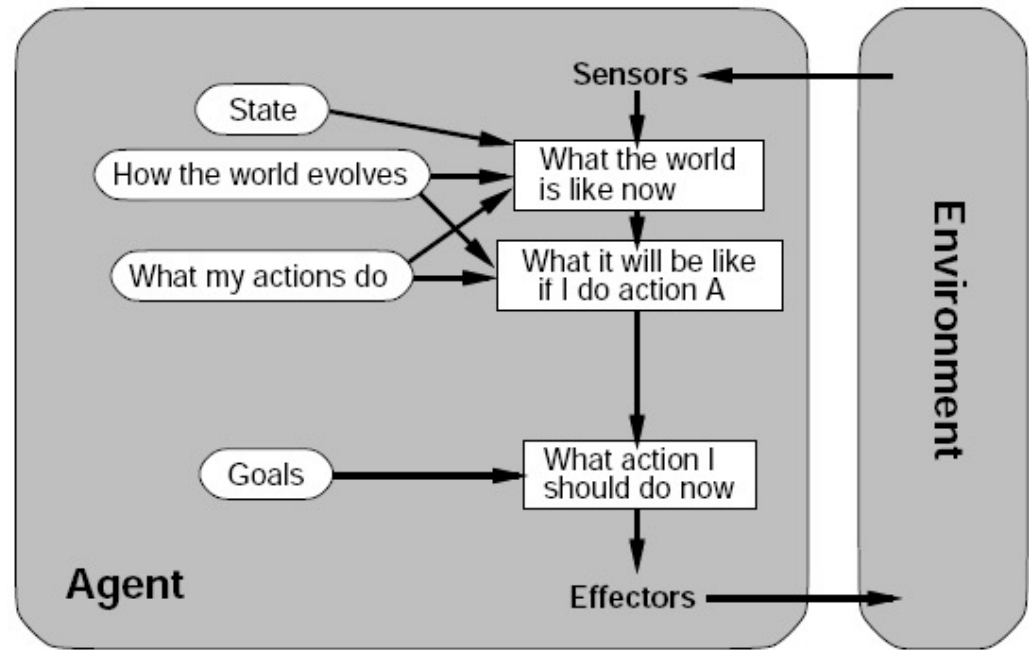
Practical Issues

- Software
 - Python (and IDE)
 - CoppeliaSim/V-rep
- Server-client style communication
 1. Start the simulation
 2. Execute the python script
 3. Communication delay*
- Library
 - Remote API bindings
 - vrep.py
 - vrepConst.py



Task 1

- Agent
 - Sensing
 - Reasoning
 - Acting
- Reading Sensor data
 - the nearest block
 - Ultrasonic sensor reading
- Moving from A to B
 - Turn
 - Move forward



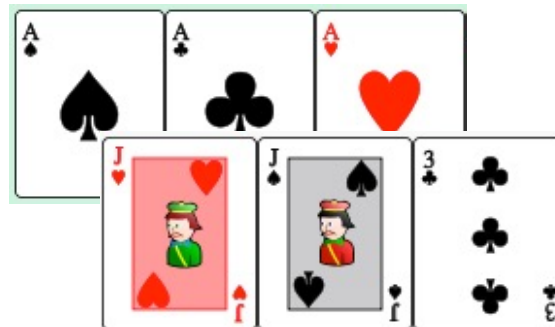
Task 2 – Poker game

- 2 poker game agents
- 50 hands each game
- Game flow – 3 phases

Card dealing phase

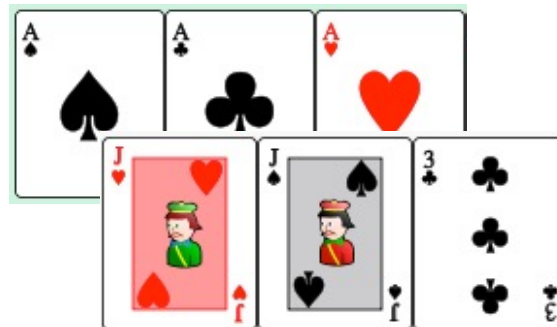
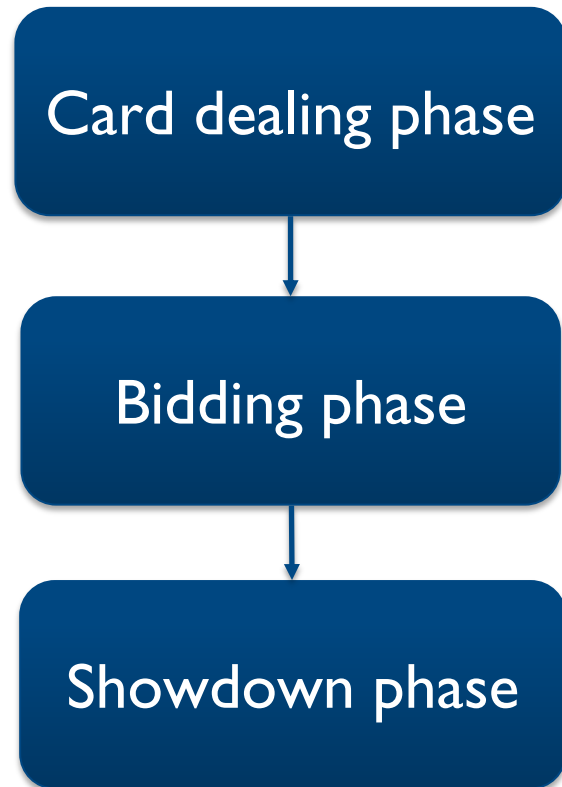
Bidding phase

Showdown phase



Task 2 – Poker game

- Card dealing phase
 - Assign 3 cards to agents
- Bidding phase
 - Amount \$0-50
- Showdown phase

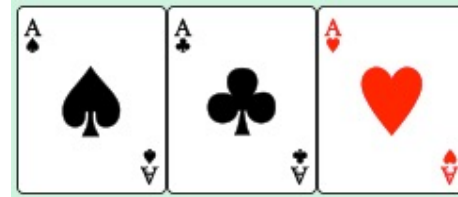


Task 2 – Poker game

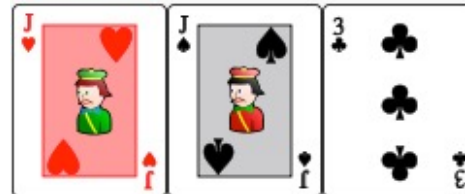
Game flow

- Card dealing phase
 - Assign 3 cards to agents
- Bidding phase (3 time)
 - Amount \$0-50
- Showdown phase

Player 1



Player 2

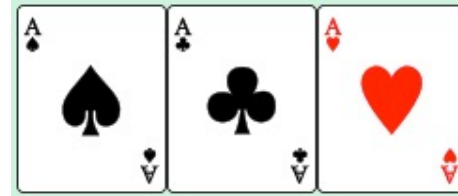


Task 2 – Poker game

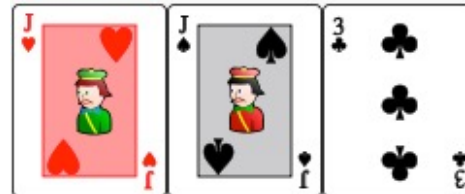
Game flow

- Card dealing phase
 - Assign 5 cards to agents
- Bidding phase (3 time)
 - Amount \$0-50
- Showdown phase

Player 1: 50



Player 2: 10

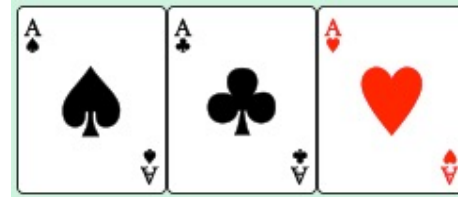


Task 2 – Poker game

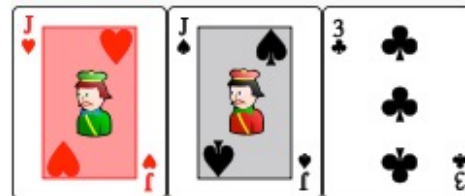
Game flow

- Card dealing phase
 - Assign 5 cards to agents
- Bidding phase (3 time)
 - Amount \$0-50
- Showdown phase

Player 1: 50 50



Player 2: 10 5

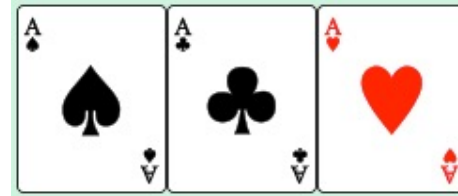


Task 2 – Poker game

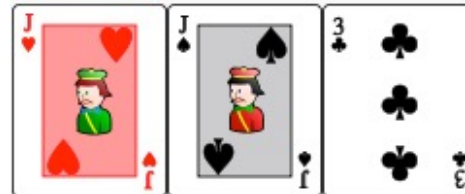
Game flow

- Card dealing phase
 - Assign 5 cards to agents
- Bidding phase (3 time)
 - Amount \$0-50
- Showdown phase

Player 1: 50 50 **50**



Player 2: 10 5 **10**

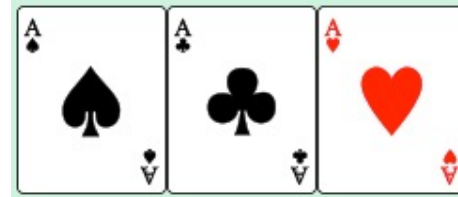


Task 2 – Poker game

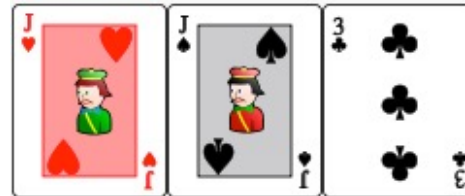
Game flow

- Card dealing phase
 - Assign 5 cards to agents
- Bidding phase (3 time)
 - Amount \$0-50
- Showdown phase

Player 1: 50 50 50



Player 2: 10 5 10



Player 1 win: Player 1 got \$175

Task 2 – Poker game

- Showdown phase
– Evaluate hand

Rank	Name	Example
0	Five of a kind*	
1	Straight flush**	
2	Four of a kind	
3	Full house	
4	Flush**	
5	Straight**	
6	Three of a kind	
7	Two pair	
8	One pair	
9	High card	

Task 2 – Poker game

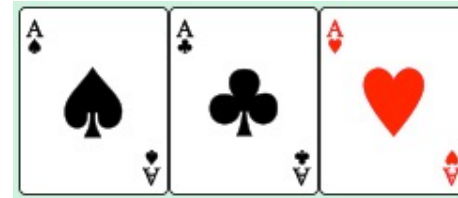
- Showdown phase
 - Evaluate hand
- Three card poker
 - 3 of a kind
 - 1 pair
 - High card

Rank	Name	Example
0	Five of a kind*	
1	Straight flush**	
2	Four of a kind	
3	Full house	
4	Flush**	
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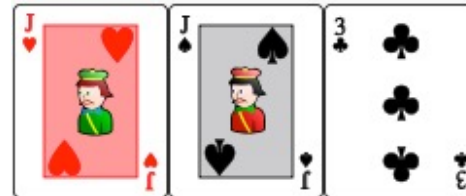
Tasks

- Random agent
- Fixed agent
- Reflex agent
- Agent with memory

Player 1: ?



Player 2: ?

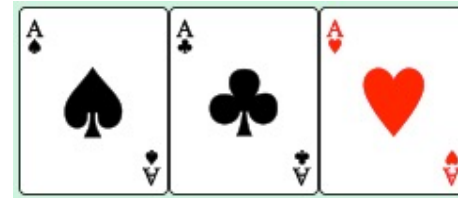


PEAS description (performance measure,
environment actuators, sensors)

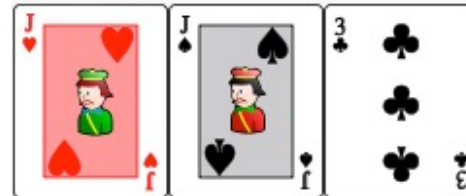
Tasks

- Random agent
- Fixed agent
- Reflex agent

Player 1: ?



Player 2: ?



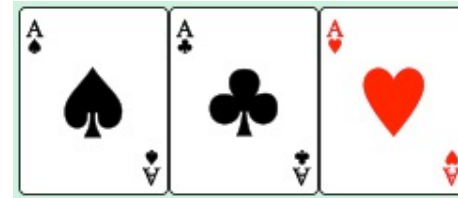
- Own hand
- Amount of money bidden

PEAS description (performance measure,
environment actuators, sensors)

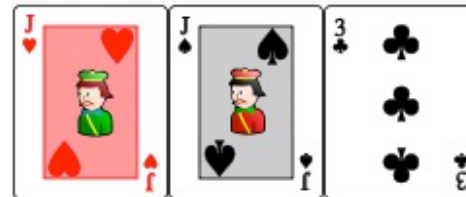
Tasks

- Random agent
- Fixed agent
- Reflex agent
- **Agent with memory**
 - Own hand
 - Amount of money bidden
 - **Opponent's hand during showdown phase**

Player 1: ?

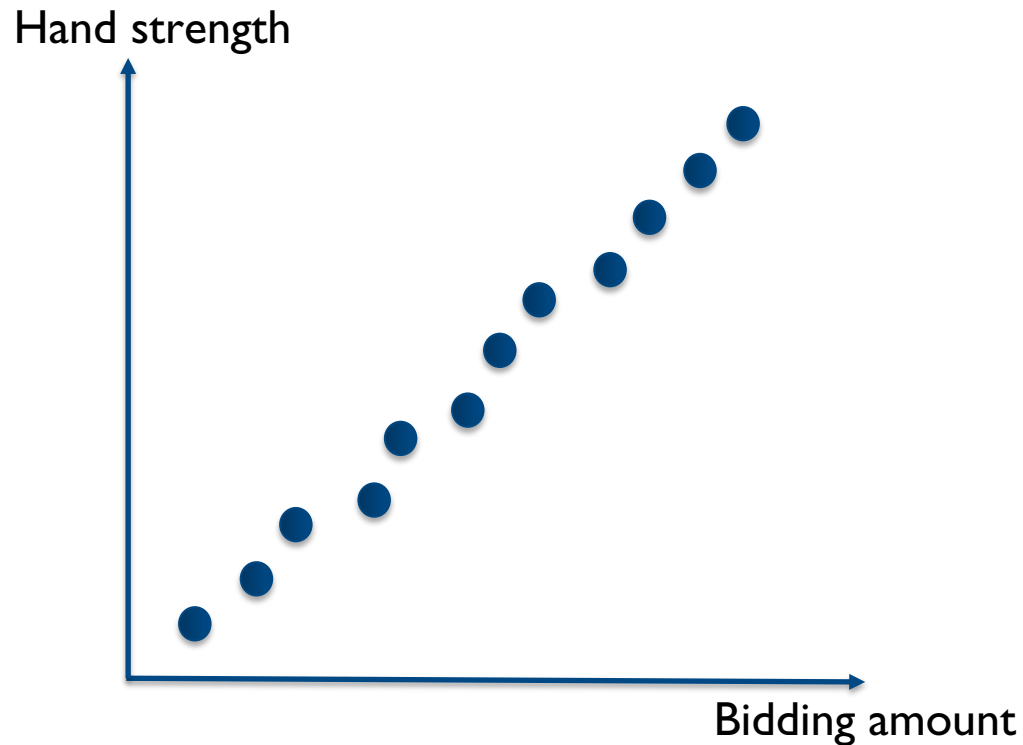


Player 2: ?

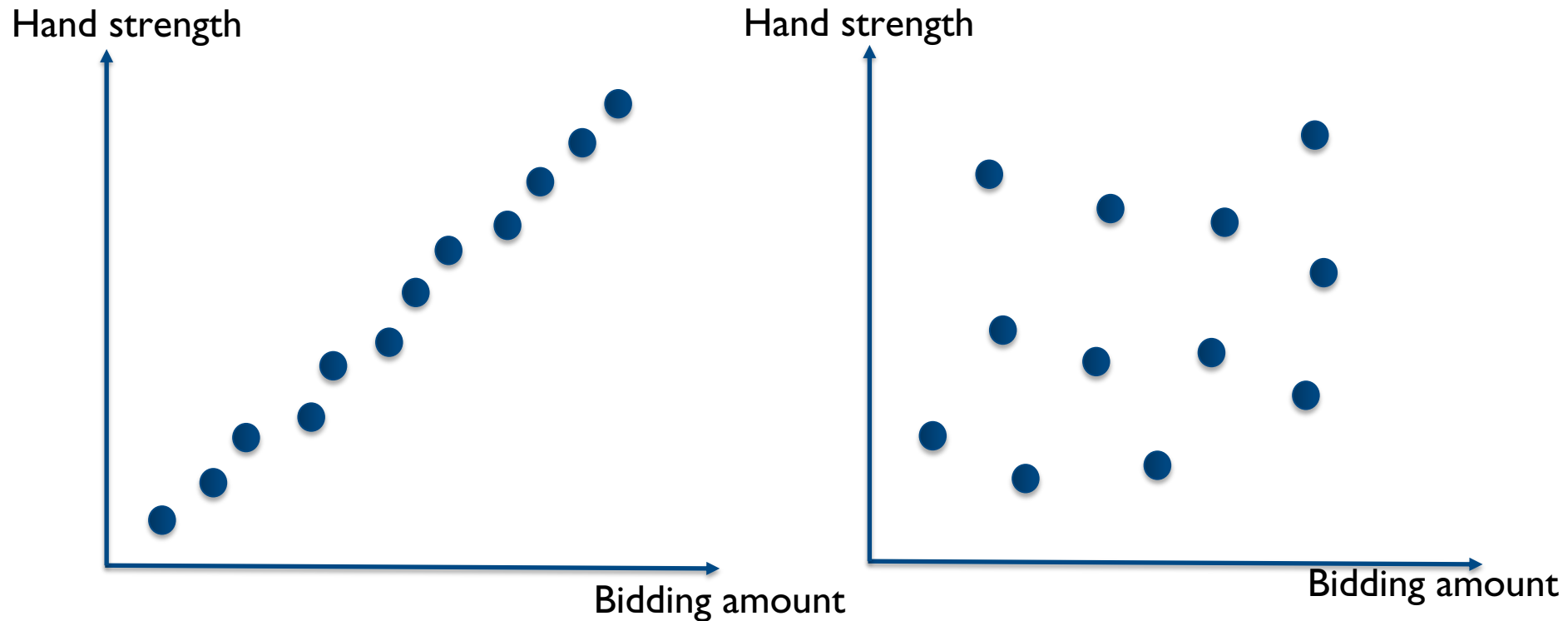


PEAS description (performance measure, environment actuators, sensors)

Agent with memory



Agent with memory



Reporting and Grading

- Submit your lab on the Blackboard
 - a short report about what you have done
 - Code
- Pass/fail/extra credits
- Contact: Yuantao Fan
 - yuantao.fan@hh.se
 - F505B



Questions?

Task 2 Poker

- Assigning hands (3 cards) to each agent
 - Drawing 6 cards from one deck
- Hand evaluation function
 - Consider rank (and suit)
 - A (strongest) , K, Q, J, T, 9, 8, 7, 6, 5, 4, 3, 2 (weakest)
 - Spade (strongest), heart, club, diamond (weakest)
 - Please feel free to implement you own function
- Sensor input to the agent
 - Hand of the agent (available during card dealing phase)
 - Hand of the opponent (showdown phase)
 - Coins agents bid