Exercise 1

Question 1

a) "An agent is a computer system that is situated in some environment and that is capable of autonomous action in this environment in order to meet its delegated objective". Woolridge

1, Affect the environment.

2, Autonomy is the only general requirement.

3, On behalf.

b) 1) Reactivity – respond changes in environment.

2) Proactiveness – take initiative

3) Social – interact with other agents

i) Cooperation – working together

ii) Coordination – manage interdependencies

iii) Negotiations – reach agreements

c) "Endow" agents with mental states;
Desires & Beliefs

1, Desires modelled by maximazing expected utility

2, Beliefs from info processes

3, Inspiration from biology, social science.

4, Key component of agent-based systems.

d) Agents share common goals to

1) improve overall goal

2) Simplify the design task.

3) In contrast to MAS (i.e. self-interested and different goals)

Question 2

a) This is a decision-making problem since it does not involve multiple agents

- Environment is static
- One run

Def. of expected utility

$$EU(A_g, Env) = \sum_{r \in R(A_g, Env)} U(r) P(r | A_g, Env)$$

when $\sum_{r \in R} P(r(Ag, Env)) = 1$

we have to define stakeholders, Ag_1 and Ag_2,
and their corresponding available states, with
outcomes and prob of outcomes.

$Env = \langle E, e_0, \tau \rangle$ is the environment

with $e = \{e_0, e_1, e_2, e_3, e_4, e_5\}$ set of possible states

e_0 is initial state

$T(e_0 \xrightarrow{\alpha_0}) = \{e_1, e_2, e_3\}$ is state transition func for action α_0

$T(e_0 \xrightarrow{\alpha_1}) = \ldots$ for α_1

We have two "agents"

$A_{S_1}(e_0) = \alpha_0$ uses action 0

$A_{S_2}(e_0) = \alpha_1$ —— 1

We also have prob of ending in another state

$$P(e_0 \xrightarrow{a_0} e_1 \mid Ag, thw) = 0.5$$

The utility of

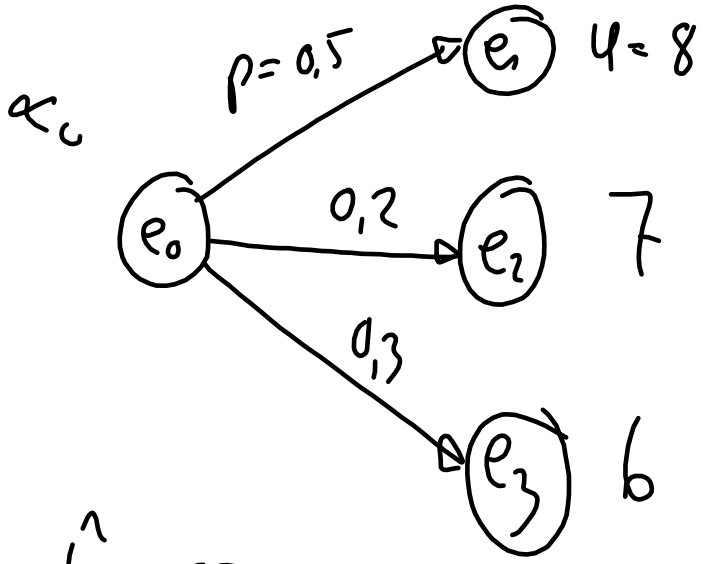
$$U(e_0 \xrightarrow{a_0} e_1) = 10$$

Lets calculate if $\sum u(\cdot) = 1$

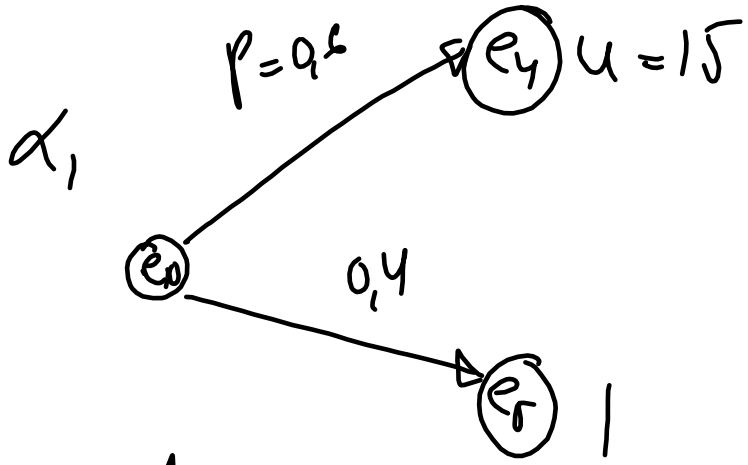
$$\left.\begin{aligned} P(e_0 \xrightarrow{\alpha_0} e_1) &= 0{,}5 \\ P(e_0 \xrightarrow{\alpha_1} e_2) &= 0{,}7 \\ P(e_0 \xrightarrow{\alpha_2} e_3) &= 0{,}3 \end{aligned}\right\} = 1$$

$$\left.\begin{aligned} P(e_0 \xrightarrow{\alpha_0} e_4) &= 0.6 \\ P(e_0 \xrightarrow{\alpha_1} e_5) &= 0{,}4 \end{aligned}\right\} = 1$$

b) Calc the exp utility of both agents strategies/actions



$\hat{u}_1 = 0{,}5 \cdot 8 + 0{,}2 \cdot 7 + 0{,}3 \cdot 6 = 7{,}2$



$$\hat{u}_2 = 0.6 \cdot 15 + 0.4 \cdot 1 = 9.4$$

$\Rightarrow$ A_{S_2} (strategy) is optimal in this env.
using α_0 and α_1

$$U_1(A_{S_1}/Env) < U_2(A_{S_2}/Env)$$

Question 3

a) Communication = the process of
sharing data / information / meaning

1) Communicating data

2) Ontologies for meaning

4) Result observing (e.g. in robotics MAS)

1) Confidence - Multiple observations (assumed independent) strengthen statistical overall solution

2) Completeness - Broader or larger sample area

3) Precision - closeness to observation

4) Timeliness - faster sampling of large area