COMP9414 Tutorial

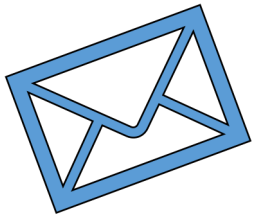
Week 1

Participation marks

- No requirement to speak or ask questions
  - Good if you do but not necessary for marks
- Attendance will be checked through blackboard collaborate
  - Total duration attended, number of times reconnected
- Small, simple activity to ensure tutorial completion
  - Just need an attempt

Tutorial Progression

- Provide some background information
- Sequentially go through the questions
  - Might not go through them all
- Will upload these slides after the class



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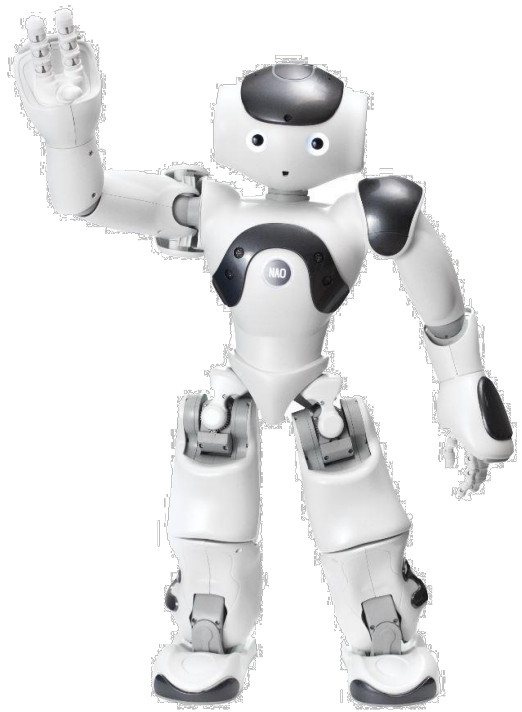
Question 1

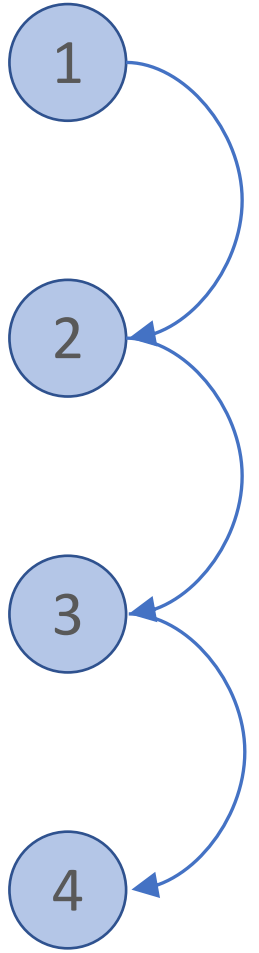
Discuss ways that advances in Robotics bring society “good” and “evil”.

- Term ‘Robotics’ is somewhat different to how people imagine it
  - Self-driving cars
  - Automated weapon systems
  - Health-care robots (Roomba)
  - Soccer robots
  - Industrial arms



Question 2 - PAGE

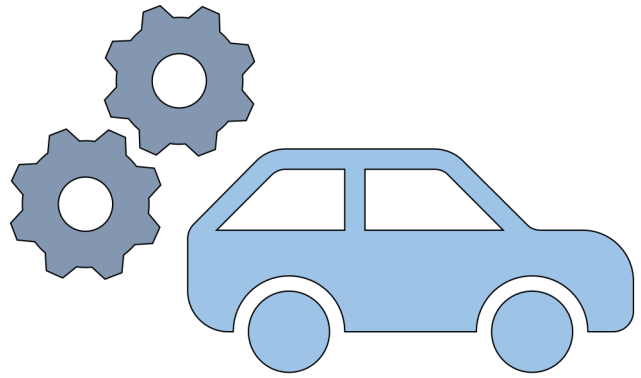
- Perceptions
  - Stimulus (input) accessible by the robot
- Actions
  - Functions that the robot can execute
- Goals
  - What the robot wants to achieve
- Environment
  - Context of the robot or what it can affect



Question 2 – Self-driving Car

- Perceptions
  - Camera, radar, lidar, temperature

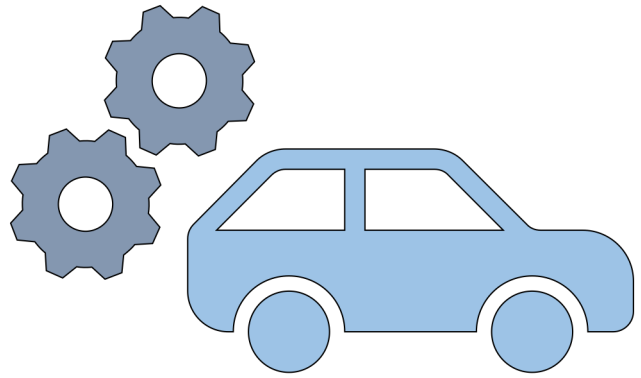
- Actions
  - Lights, turning, opening doors, Wheel check, accelerate



Question 2 – Self-driving Car

- Goals
  - Reach a location
  - Not get any speeding fines
  - Not run any red lights

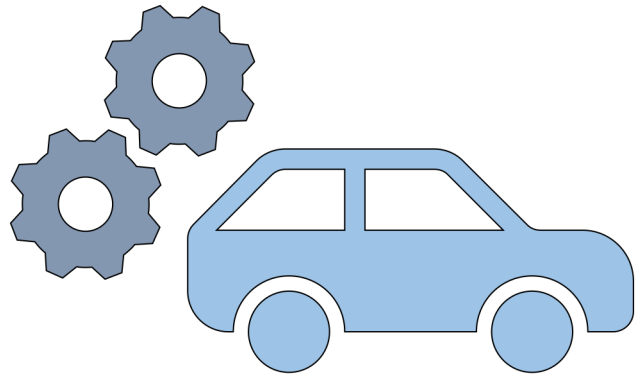
- Environment
  - Pedestrians, traffic lights, trees, road, shops, building, policeman, cyclists, other cars, animals



Question 2 – Self-driving Car

- Fully observable
  - Access to complete environment
  - Stimulus is perfect

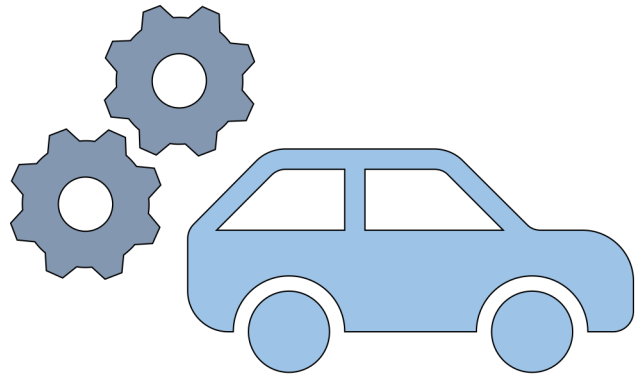
- Partially observable
  - Access to some portion of the environment
  - Input may be noisy or incomplete
  - More complex internal state required



Question 2 – Self-driving Car

- Deterministic
  - Next state is determined by agent actions

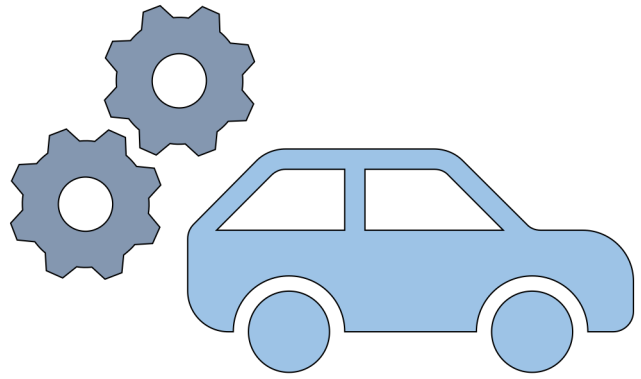
- Stochastic
  - Actions can only influence the environment
  - External actors can still change it



Question 2 – Self-driving Car

- Episodic ~ Image
  - Current state is independent to previous one
  - Agent only needs to know current state

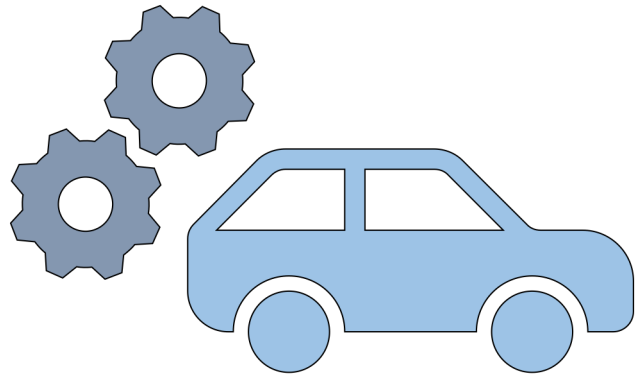
- Sequential ~ Movie
  - Current state is dependent on previous one
  - Agent must remember previous states to select an action



Question 2 – Self-driving Car

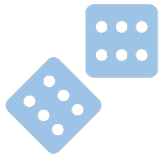
- Static
  - Environment remains fixed until the agent acts

- Dynamic
  - Environment can change independent to the agent



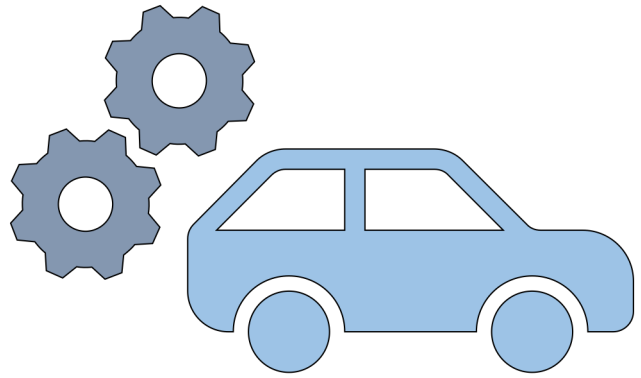
Question 2 – Self-driving Car

- Discrete
  - Limited number of percepts and actions
  - Like rolling a six-sided dice



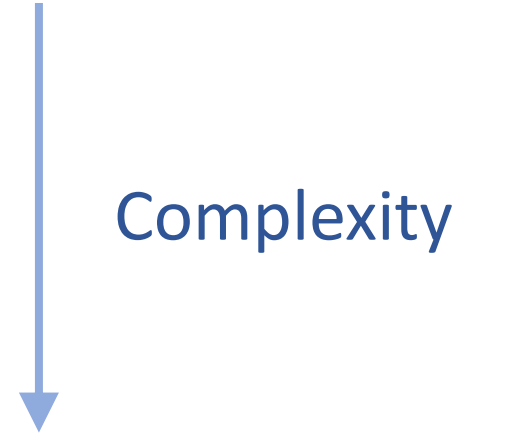
    - Only 6 possible outcomes

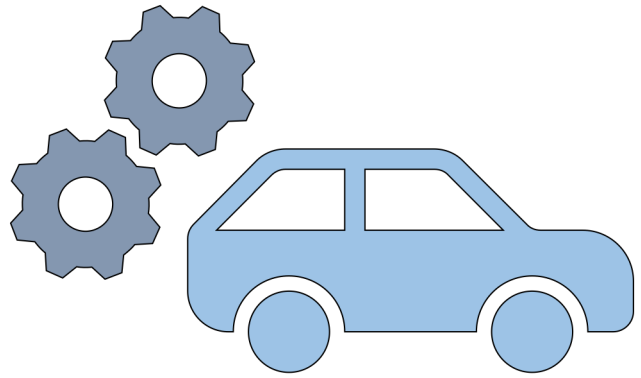
- Continuous
  - Many different percepts and actions
    - Measured to some level of precision
  - Like measuring temperature
    - Massive range of possible values



Question 2 – Self-driving Car (Architecture)

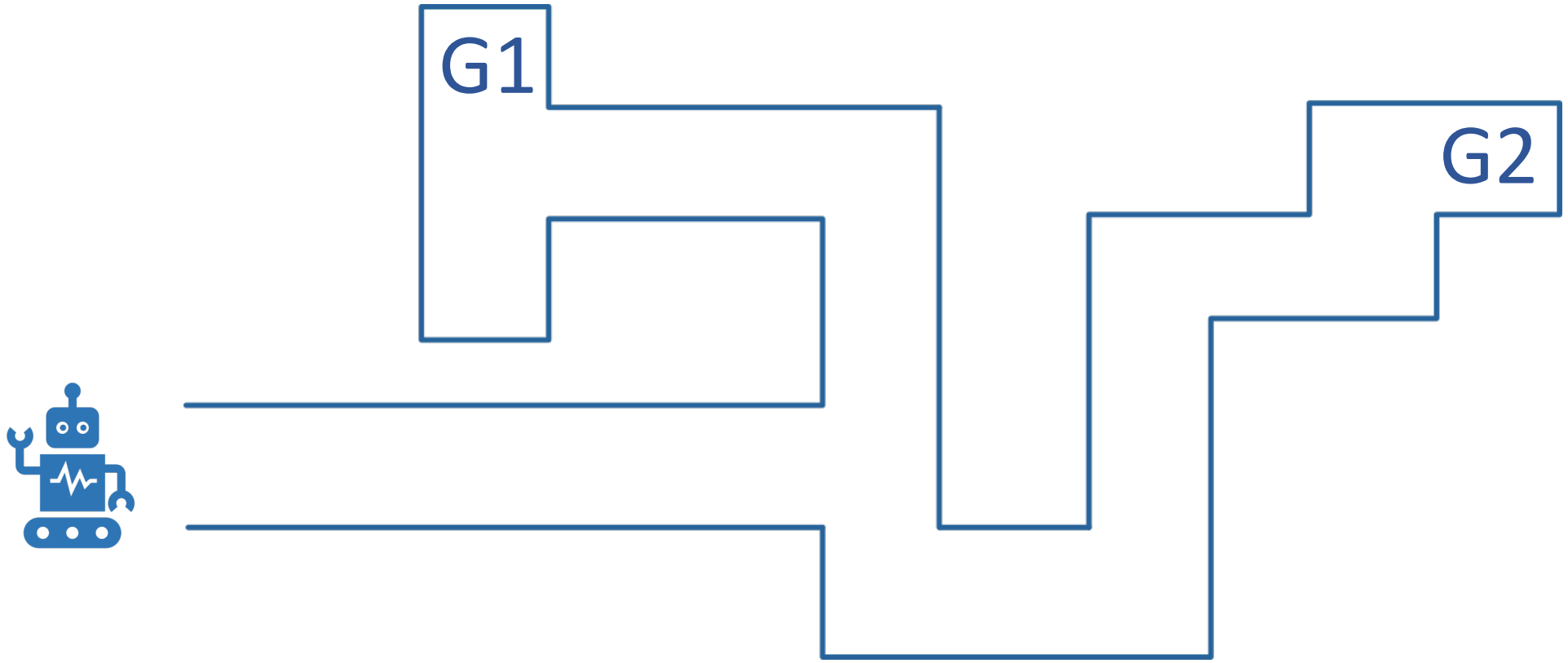
- Reflex/Reactive agent
  - Executes some action based on a percept
    - Utilises condition-action rules
- Goal-based agent
  - Executes some action to achieve a goal
- Utility-based agent
  - Quantifies the desirability of a state
  - Selects the one that is the highest





Question 3

Does the simple strategy of always turning left when encountering an obstacle enable the robot to always reach its goal?



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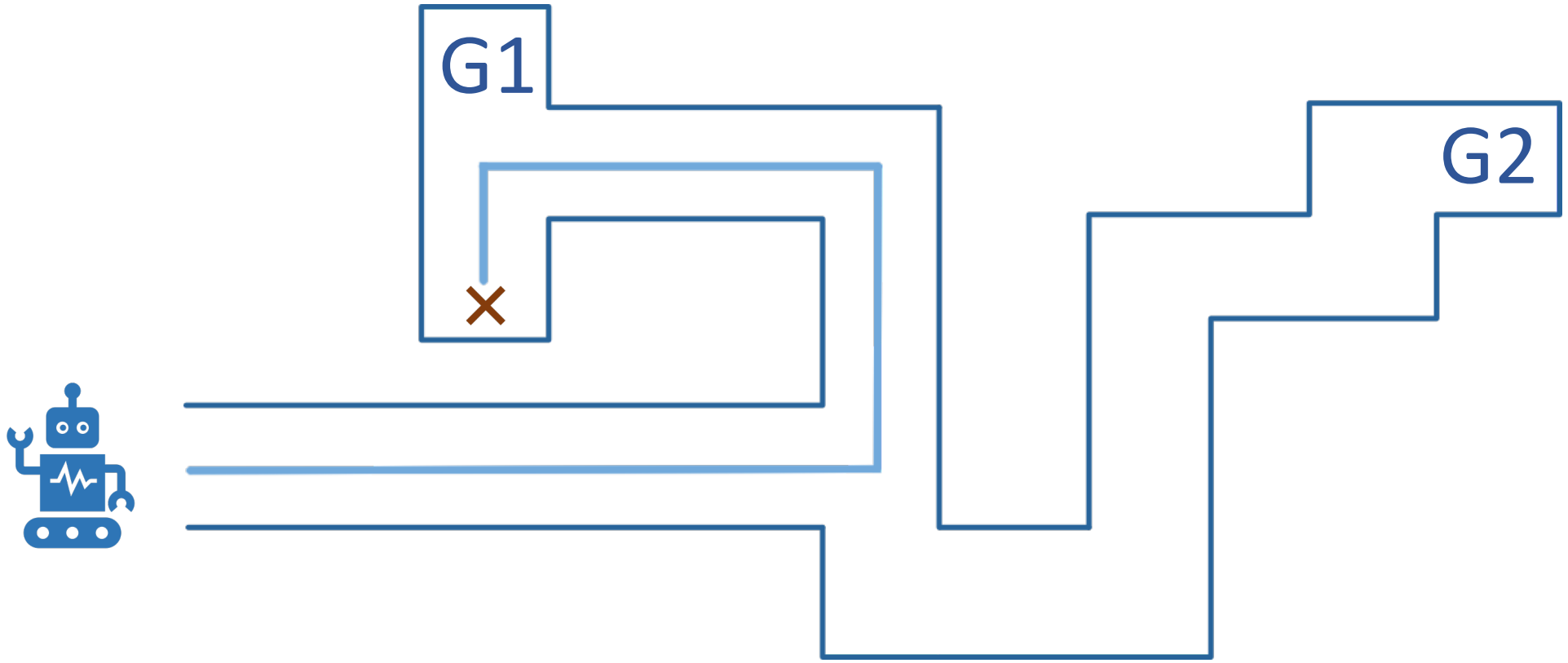


Question 4 - Autonomy

1. The agent's behaviour is partly determined by its perceptual experience rather than the knowledge of the designer
    - Reliant on perception to be taught
    - Still utilises some foundational information

2. The agent can control its own behaviour
    - Does not necessarily require perception

Question 5 – Deterministic Environment

1. Next state = current state + executed action
   - What if the action fails?
   - Outcome may be stochastic

2. Next state = current state + selected action

Question 5 – Deterministic Environment

An agent need not worry about uncertainty in a fully observable, deterministic environment

- If an agent acts randomly, is this still true?

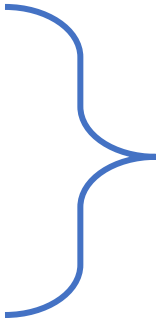
Question 6 – Turing Test

Interrogator asks a series of questions to some entity

- Entity may be a human or robot

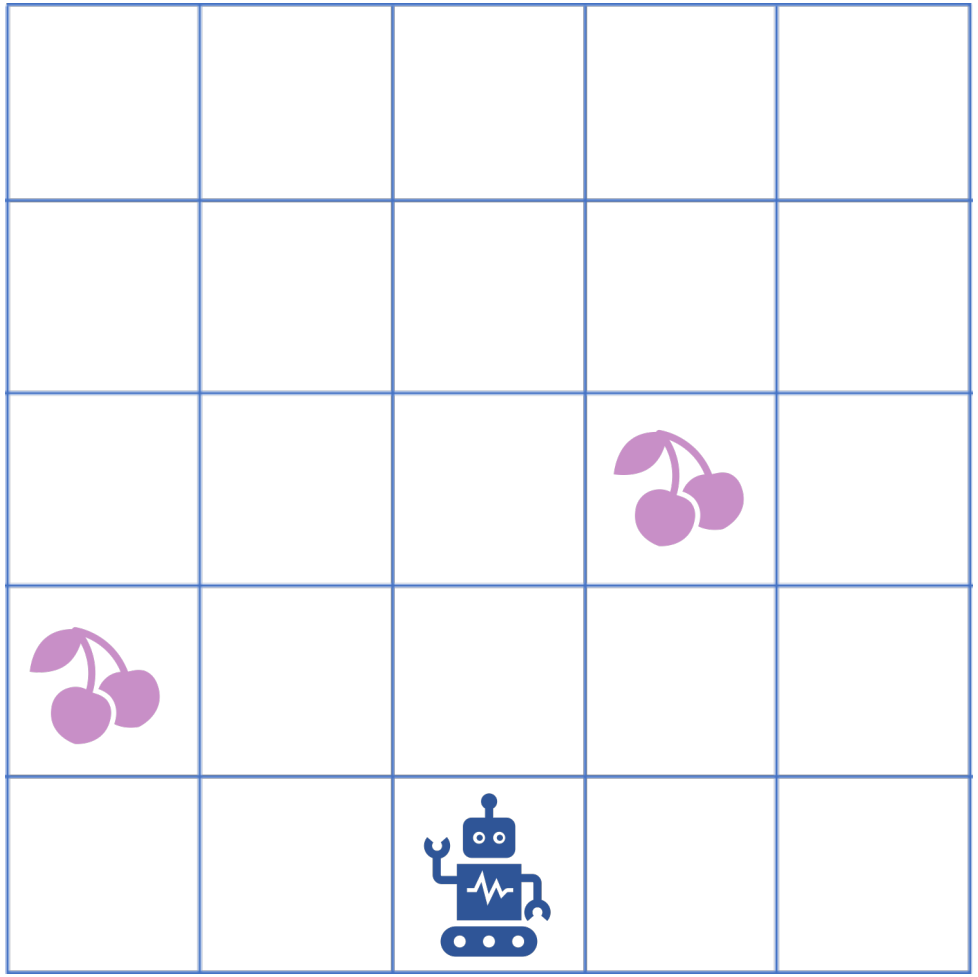
- Robot must convince interrogator that it is a human
  - Text recognition
  - Logic induction

- True turing test requires environment perception
  - Speech and visual recognition
  - Possibly manipulation



Is this better?

Question 7 – Hunter Agent Introduction



- grid_end = 4 (zero-based)
- grid_size = 5

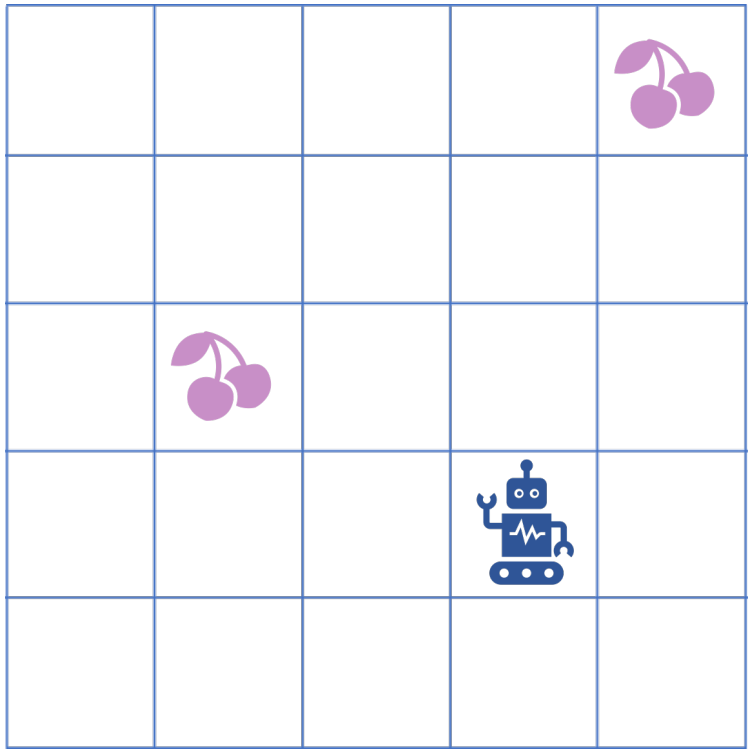
- All entities start at random positions

- Environment updates in ‘ticks’

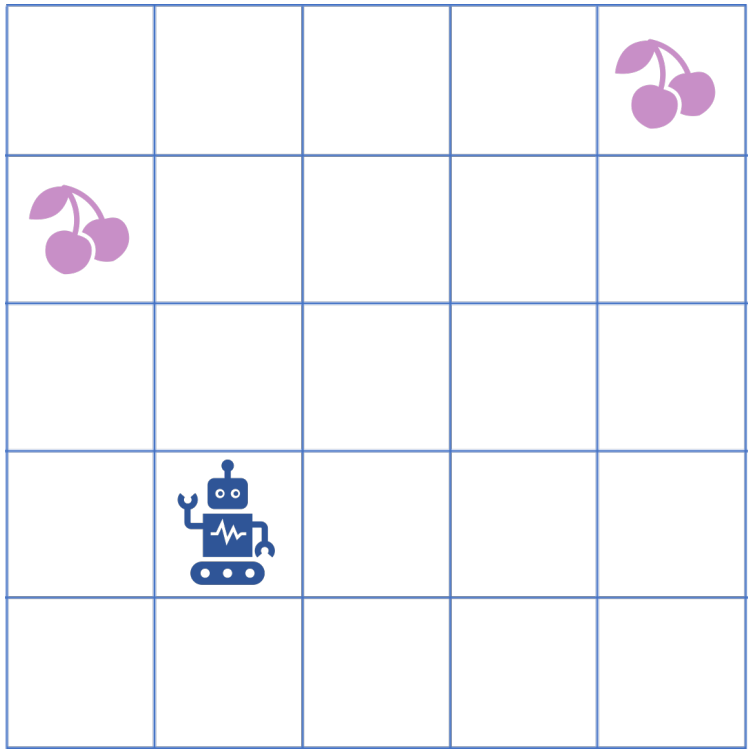
- Food has a probability to appear and disappear randomly on the grid

Question 7 – Hunter Agent Introduction

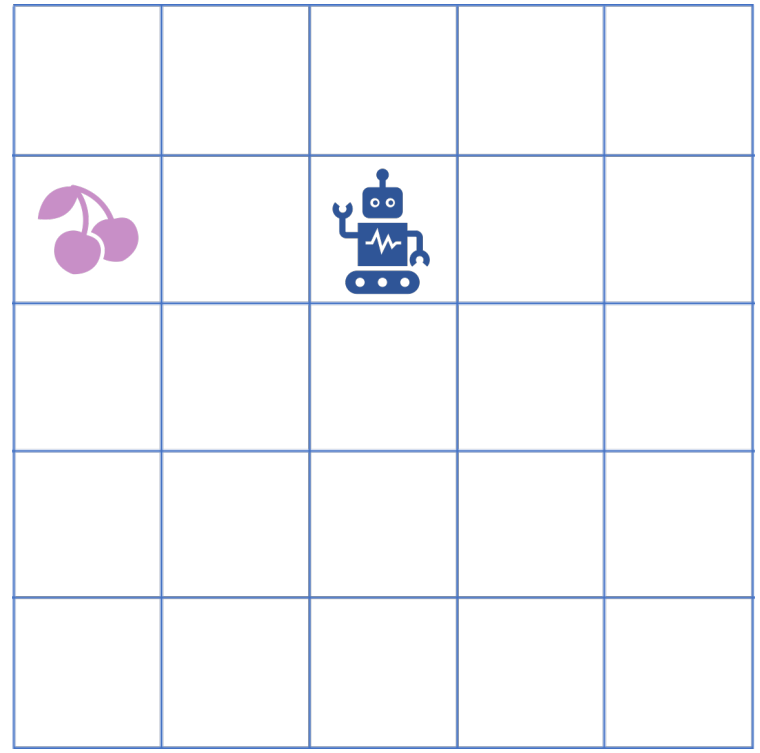
Tick x



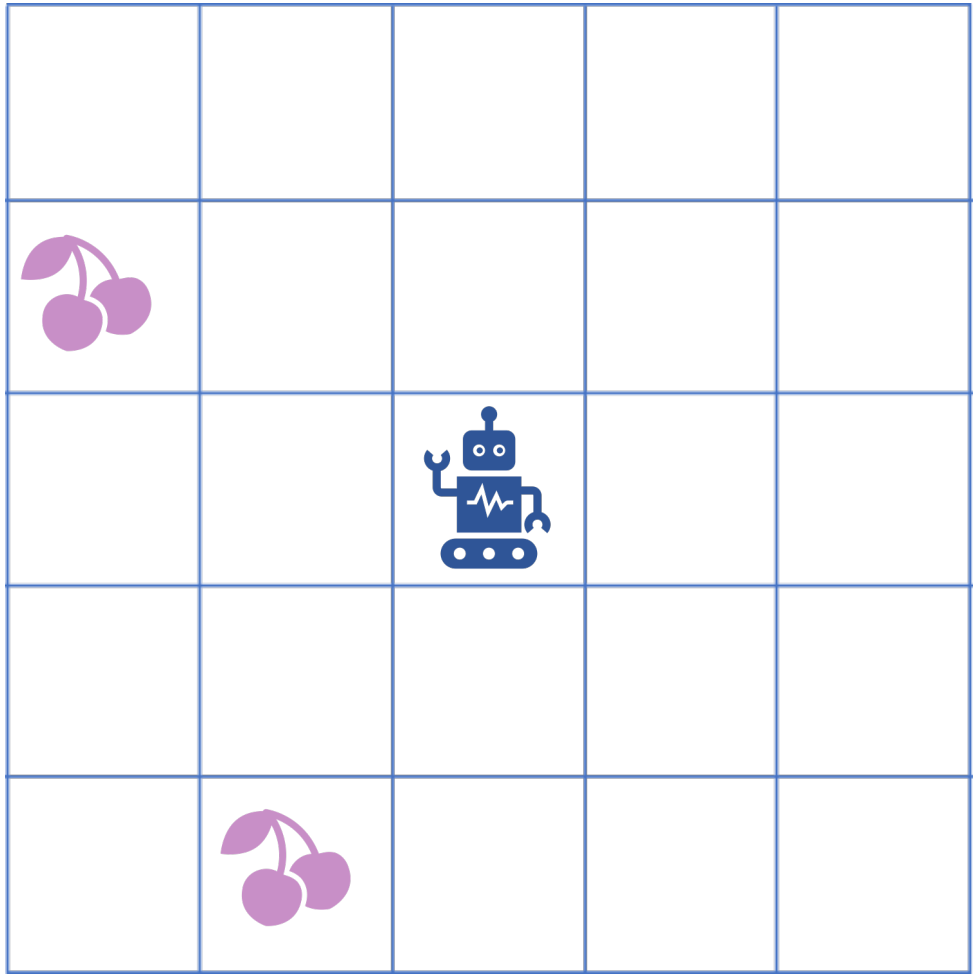
Tick x + 5

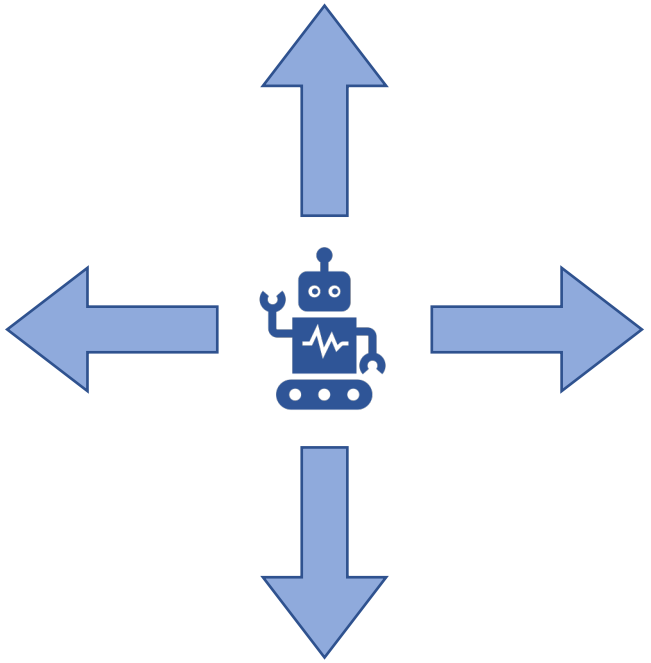


Tick x + 10



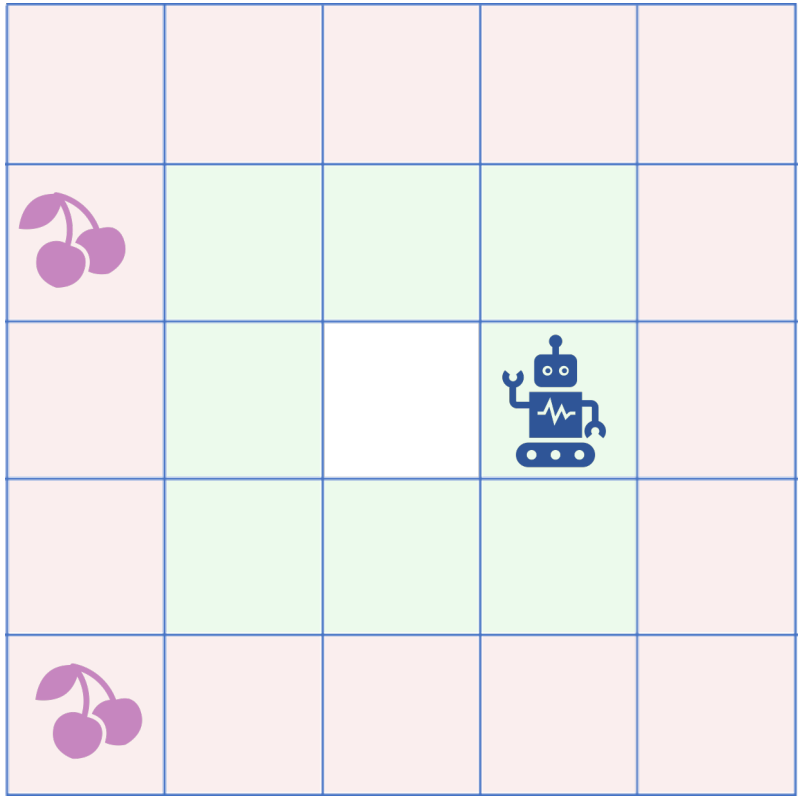
Question 7 – Hunter Agent Introduction





Default Movement

Question 7 – Hunter Agent Introduction



Partially observable environment

- Based on Euclidean distance

$$distance = \sqrt{(agent_x - food_x)^2 + (agent_y - food_y)^2}$$