COMP250: Artificial Intelligence

2: Designing AI behaviours

Agents

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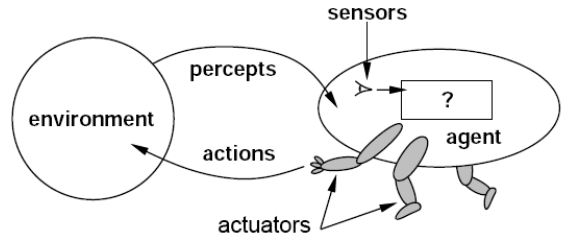

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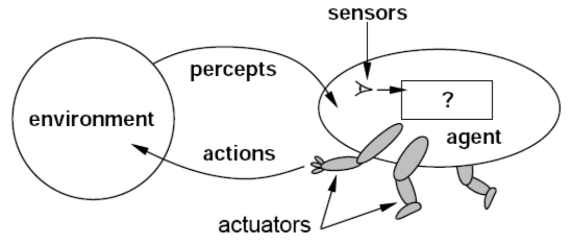

An **agent** is anything which perceives an **environment** through **sensors**, and acts upon that environment through **actuators**.

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- A **performance measure** evaluates a given state for how well it fits the goal

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- A chess AI
- A human

Types of environment

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- These properties influence the choice of AI architecture we use to build agents

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- E.g. a chess game is fully observable, a poker game is partially observable

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- **Cooperative**: all agents share the same performance measure
- **Competitive**: agents' performance measures are in opposition to each other (i.e. if one agent "wins", another "loses")

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- E.g. chess is deterministic; any board game involving dice rolls or random card draws is stochastic

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- E.g. most board games are static, most (non turn-based) video games are dynamic

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- Continuous problems are hard so we sometimes **discretise** them

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- For the real world: technically **no** (but we have physics, sociology, economics etc to give us good approximations)

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- All(?) AI problems can be expressed in terms of creating an agent that optimises some performance measure in some environment
- Agent design boils down to: given a **percept** (and possibly some **memory** of past percepts/actions), choose the best **action** to take now

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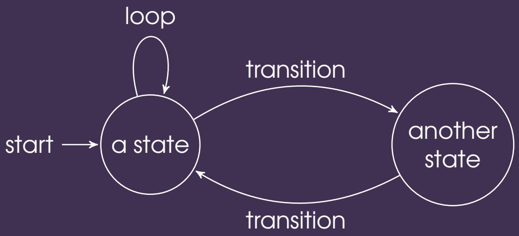
- Which state the FSM is in dictates what **actions** the agent takes

State transition diagrams



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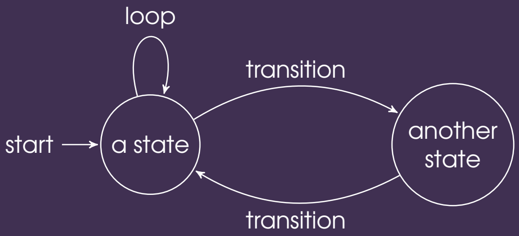

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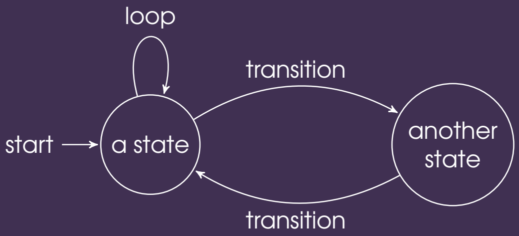

- FSMs are often drawn as **state transition diagrams**
- Reminiscent of **flowcharts** and certain types of **UML diagram**

FSMs for AI behaviour

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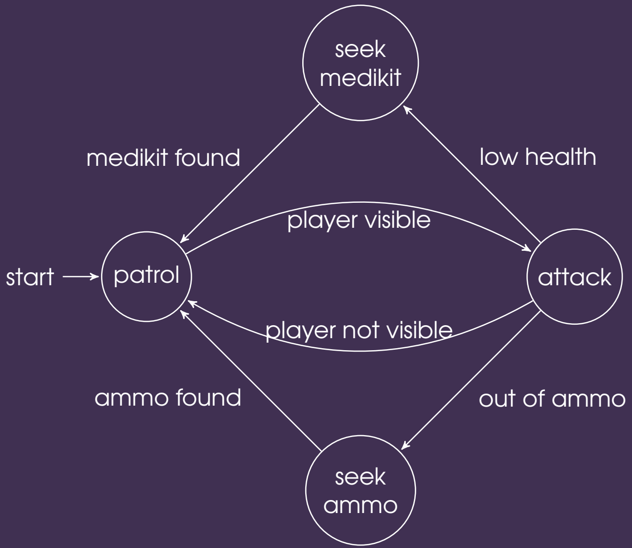
- If you are low on ammo, run away and find ammo. Then resume patrolling


seek medikit
medikit found
low health
player visible
start
patrol
attack
player not visible
ammo found
out of ammo
seek ammo

Other uses of FSMs

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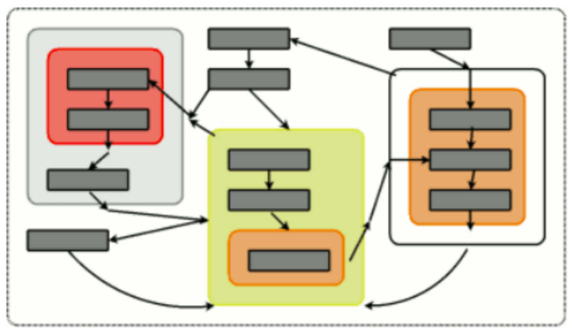
- Functional approach: represent state by a function delegate
- Coroutine approach: encode your FSM logic as a procedure which runs as a coroutine (requires either refactoring logic into structured loops, or using `goto`...)

Hierarchical FSMs



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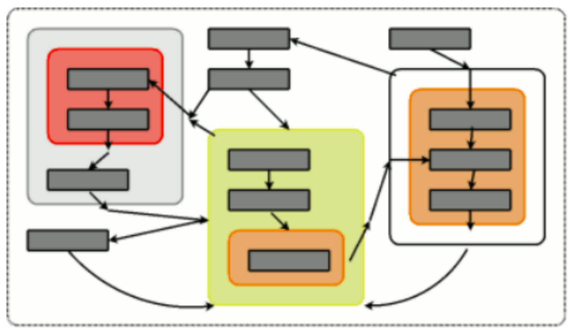

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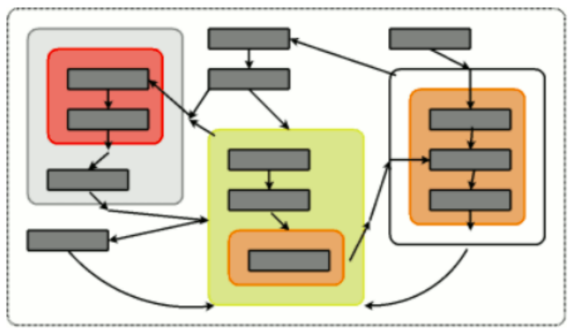

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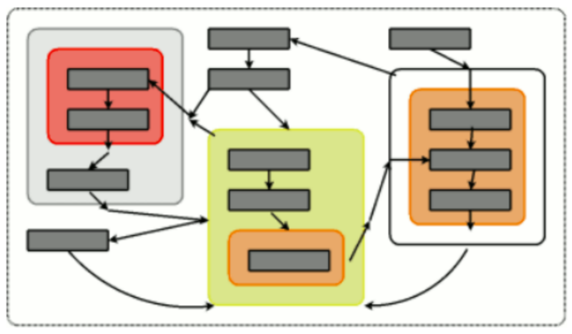

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- Hierarchical FSMs allow to group states into **super-states** to simplify defining transitions

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- Historically an important technique for game AI
- However other techniques such as behaviour trees are more flexible and better suited to designing complex behaviours