Lecture 14 - Cognitive Architectures

Robot control with layers

- Hierarchical structure of a robots brain is used in noisy environments
- Each layer performs more complex functions than the lower layer
- For example, the first layer may be responsible for avoiding obstacles and the second layer may be responsible for movement.
- Higher layers can overrule the functions of the lower layers, although the lower layers still work when we add the higher ones.
- Each layer consists of behaviour modules that communicate asynchronously without a central controller. For example the collision detection layer has sensor modules, danger detection modules, and an engine system - and these modules communicate with each other to agree on a decision that affects the behaviour.
- This method demonstrates the bottom-up approach typical of artificial life: starting with simple, elementary modules, gradually building up using evolution, emergence and development. Traditional AI employs the top-down methodology: a complex behaviour is analysed and divided to build a system that will ultimately reflect the details of this behaviour.

Levels of autonomy

- In many applications of agents, the optimal level of their autonomy is different depending on the application and requirements: speed of operation, low cost, realism, safety.

Level of autonomy	Agent goes to a specific location	Agent applies a specific action
Guided	Agent needs to receive a list of	Agent needs to receive information

Level of autonomy	Agent goes to a specific location	Agent applies a specific action
	collision-free positions	about the action
Programmed	Agent is programmed to follow a path while avoiding collisions	Agent is programmed to apply the action in appropriate circumstances
Autonomous	Agent chooses a path to follow to reach the goal	Agent decided how to apply the action
Autonomous	Agent decides if...	Agent decides if...
Autonomous	Agent decided what to do	Agent decided what to do

Cognitive architectures

- Cognitive architecture must change through development and efficiently use knowledge to perform new tasks

Russell and Norvig classification of AI

	Like human	Rationally
Think	Systems that think like humans	Systems that think rationally
Act	Systems that act like humans	Systems that act rationally