

IST Artificial Intelligence, Simulation and Modelling Notes

1.1 Artificial Intelligence

Definitions

- Intelligence includes:
 - o Reasoning – to solve a problem logically and draw conclusions
 - o Empathy – to understand what it is like to be as another person/situation
 - o Predicting – to foretell a future situation
 - o Decision-making, communicating and experiencing
- Artificial intelligence involves the development of computer systems that imitate human ability

Uses of AI

- AI is used in:
 - o Games – more engaging to play against computers
 - o Robotics – enable robots to work more effectively
 - o Expert systems – system that is used to solve problems where no human expert is available
 - o Natural language processing – systems that can recognise/understand human speech

1.2 Areas of Artificial Intelligence

Intelligent Systems

- Intelligent system – system with artificial intelligence able to use available data to make decisions

Knowledge Bases

- Knowledge base – set of rules or facts to make decisions
- Can contain two types of knowledge:
 - o Factual – information found in texts/widely known facts
 - o Heuristic – rules or probabilities rather than specific instructions, e.g. IF statements

Demons, Agents and Expert Systems

- Daemons/demons – programs are activated when a value is triggered e.g. anti-virus, paperclip in word
- Agent – program that performs a processing or information gathering task e.g. search engines
- Expert system – program that provides decisions about a problem, most common form of intelligence system
 - o Data about problem are entered, inference engine examines each part of problem, then, using facts and rules, makes decisions
 - o User > User Interface > Inference Engine (interprets rules) > Knowledge base and Database
 - Knowledge base – rules, concepts, Database – working memories, known/inferred facts

Neural Networks

- Neurons exchange messages with other neurons in the human brain
- Artificial neural network is a computer system designed like the human brain
- Good at recognising patterns, voice/image recognition, financial analysis, weather forecasting

Modelling and Simulation

- Computer model – an outline of what happens in the real world
 - o Models have variable values calculated using data, e.g. weather
- Simulations – use of models to predict what will happen under different conditions
 - o What-if situations – changes occur, e.g. weather maps that predict the future
- Advantages – safer, cheaper, efficient, good predictions, less dangerous
- Disadvantages – inaccuracies, complexity, controlled environment different from real

AI Requirements

- Hardware requirements
 - o Large amount of power and storage for amount of data to process, complexity of AI
- Software requirements
 - o Models and simulations – spreadsheets, general software
 - o Neural networks – graphical, more specific software
 - o Expert System – database or inference engine, user interface