CS26210: Artificial Intelligence Concepts

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Aspects of Intelligence

Memory

Reasoning

Learning
  forward - curiosity
  backward - experience

Understanding

Perception

Sensing

Recognition

Intuition

Imagination

Creativity

Association

Introspection

Flexibility

Common sense

Co-ordination

Communication

Analysis

Calculation

Absraction of concepts

Organisation of ideas

Judgement & decisions

Planning & prediction

Artificial Intelligence

- Artificial Intelligence is concerned with understanding the principles and building of working models of intelligent behaviour

- Two approaches:
  - Understanding the brain
  - Making computers more useful.

History of AI

- AI has a long history
  - Ancient Greece
  - As old as computers themselves (c1940)
- Origins
  - The Dartmouth conference: 1956
    - John McCarthy (Stanford)
    - Marvin Minsky (MIT)
    - Herbert Simon (CMU)
    - Allen Newell (CMU)
    - Arthur Samuel (IBM)
- The Turing Test (1950)

Periods in AI

- Early period - 1950's & 60's
    - Game playing
        - brute force (calculate your way out)
    - Theorem proving
        - symbol manipulation
    - Biological models
        - neural nets
- Symbollic application period - 70's
    - Early expert systems, use of knowledge
- Commercial period - 80's
    - boom in knowledge/ rule bases, FGP

Fashions in AI

Progress goes in stages, following funding booms and crises: Some examples:

1. Machine translation of languages
    1950's to 1966 - Syntactic translators
    1966 - all US funding cancelled
    1980 - commercial translators available
2. Neural Networks
    1943 - first AI work by McCulloch & Pitts
    1950's & 60's - Minsky's book on "Perceptrons" stops nearly all work on nets
    1986 - rediscovery of solutions leads to massive growth in neural nets research

The UK had its own funding freeze in 1973 when the Lighthill report reduced AI work severely

Look for similar stop/go effects in fields like genetic algorithms and evolutionary computing. This is a very active modern area dating back to the work of Friedberg in 1958.

Periods in AI cont'd

- ? period - 90's
- Real-world applications, modelling, better evidence, use of theory, ...?
- Topics: data mining, formal models, GA's, fuzzy logic, agents, neural nets, autonomous systems
- Applications
    - visual recognition of traffic
    - medical diagnosis
    - directory enquiries
    - power plant control
    - automatic cars

Current Situation

- Activity Areas
    - Computer vision
    - Natural language understanding
    - Speech Understanding
    - Expert systems
    - Robotics
    - Automatic programming
    - Data management
    - Game playing
- Techniques
    - Represenations
    - Control Structures
    - Heuristic search
    - Planning
    - Perception
    - Deduction
    - Induction
    - Learning
    - AI languages and Systems
- Core field of Computer Science
    - very active
    - at leading edge of CS
    - wide applications
    - universal problems
    - fantastic future