Computer vs. Human

Machine
1. Performs precisely defined tasks with speed and accuracy
2. Not gifted with common sense

Human
1. Capable of understanding and reasoning
2. More likely to understand the results and determine what to do next
3. Not gifted with complex computations

Humanlike Computer

The ideal hybrid
1. Continue without human intervention when faced with unforeseen situations
2. Possesses or simulate the ability to reason
3. Psychologists and their models may be helpful

Intelligent Agents

Agent
1. Device that responds to stimuli from its environment
   Sensors: to receive stimuli
   Actuators: to react

The goal of artificial intelligence ·

1. To build agents that behave intelligently

learning

Procedural knowledge
1. Learn 'How' ·
2. Usually by trial-and-error
3. Punished by poor action, awarded by good action

Declarative knowledge
1. Learn 'What'
2. Expand 'facts' in one's database of knowledge

AI Research Approaches

Performance oriented
1. Researcher tries to maximize the performance of the agents
2. Just do it
   Exhaustive search, probabilistic deduction
3. Computer scientists approach
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Simulation oriented
1. Researcher tries to understand how the agents produce responses.
2. Wait, let me figure what's going on first
   Heuristic search, classification
3. Psychologists approach

Levels of Intelligence: Not Really Intelligent
Weak AI
1. Reflex
   Actions are fixed and predetermined
2. Context aware
   Actions affected by knowledge of the environment
   Context information

Strong AI
3. Goal seeking
   Search for a solution
   Key: efficient searching
4. Learning
   Deduce from experience
   Key: identifying majority

Understanding Images Computer Vision
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Template matching
1.Compare two bitmaps Ex. recognizing well-formed characters

Image processing
1.Consider characters by the common shape Ex. recognizing hand-written characters
   Edge enhancement

   Region finding
   Smoothing

Image analysis
1.Guess what partial, obstructed objects are Ex. recognizing what the image means

3 steps in language processing
Syntax analysis
1.Parsing
2.Grammatical role of each word
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Semantic analysis
1.What action? The agent of that action? The object of that action?
2.E.g. 'Marry gave John a car' = 'John got a car from Mary'

Contextual analysis
1.E.g. people sometimes say things in a sarcastic way (嘲諷), such "That's great!".

Production Systems
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Capturing common characteristics of reasoning problems
1. Collection of states

Start or initial state
Goal state
2. Collection of productions
Rules or moves
・ Each production may have preconditions
3. Control system
・ Production to apply next

Control System
・

Search tree
1.Record of state transitions explored while searching for a goal state

Searching for goal ・
1.Searches the state graph to find a path from the start node to the goal
・

Strategies
1.Root: start state
2.Children: states reachable by applying one production
3.Walking up the tree from the goal

Types of Searches
Blind
1.Breadth-first search

2.Depth-first search

Heuristics
1.Proximity to goal

Good Heuristics
Easier to compute than a complete solution ・
Provide a reasonable estimate of proximity to a goal

Neural Networks
Artificial Neuron
1.Input multiplied by a weighting factor
2.Output
1 if sum of inputs exceeds a threshold value
0 if otherwise.
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Network is programmed by adjusting weights using feedback from examples.

Associative Memory
Associative memory
1.The retrieval of information relevant to the information at hand

Application of neural network
1.Given a partial pattern
2.Transition themselves to a completed pattern.