Perception and Cognitive Psychology

Week 1: Problem Solving

Learning Objective	Notes

Identify and explain each of Wessell's four stages of problem solving, and explain the role of insight and problem definition in human problem solving	**Definitions**
	● Problem
	    ● Situation where there is a discrepancy between current state of the world and the goal state
	● Solution
	    ● Action/series of actions that transforms current state into the goal state
	    ● Can have good/bad solutions
	Wessell's Problem Solving
	1. Define the problem
	    ● What is the goal state?
	    ● What is the current state?
	    ● What are the available actions? Constraints/limitations?
	2. Devise a strategy
	    ● Planning an action/series of actions to help you get closer to goal state
	3. Execute the strategy
	    ● Carry out plan
	4. Evaluate progress towards the goal
	    ● What is the distance between current state and goal state?
	    ● Problem is solved when current state and goal state are the same
	Determining Difficulty of Solving a Problem
	● Greater distance between current state and goal state=harder to solve
	● More difficult problems=more actions
	● Solving a problem is easier when there are less possible actions
	● Expertise in an area=easier to problem solve
	Solvability of a Problem
	● A sequence of actions is required to solve a problem
	● Well Defined Problem
	    ○ All aspects of problem is specified (current state, goal state, available actions)
	    ○ Not necessarily easy to solve or are solvable
	● Ill Defined Problem
	    ○ Some aspects of problem is not clearly specified/missing
	● Continuum of well defined/ill defined
	Insight
	● "Lightbulb" moment
	● We don't always go through the 4 stages, sometimes solutions just come to us

Describe the role of mental representations in problem solving. Define and give examples of functional fixedness, and propose strategies for reducing the effects of functional fixedness on problem solving	**Mental Representations**
	- Definition
	  - The way our beliefs, knowledge and memories are stored/represented in our minds
	  - Can be wrong and don't always correspond to the truth
	- MR of Initial State
	  - What is the current state of the world?
	  - What do I know and what don't I know?
	- MR of Goal State
	  - How do I want the world to be?
	  - In what ways is it different from now?
	- MR of Available Actions
	  - What can I do to act on the current state of the world?
	  - What are the constraints?
	Functional Fixedness
	- Definition
	  - Mental block that stops you from finding creative solutions
	- Stronger in adults than children
	- Decreased functional fixedness is indicative of creative thinking
	- Increased functional fixedness can be useful when solution has to be traditional
	Reducing Functional Fixedness
	- Training people to find creative solutions
	- Encourage people to think of alternative uses on items by giving objects nonsense labels
	- Ask participants to list alternative uses for objects

Explain the difference between heuristic strategies and algorithmic strategies in problem solving, and provide examples of each kind of strategy	**Algorithms**
	- Definition
	  - Procedure that guarantees solution
	  - Set of steps with a stopping condition
	  - Can only exist for some types of problem
	  - Not guaranteed to find solution efficiently
	- Insertion Sort Algorithm
	Heuristic
	- Definition
	  - Rule of thumb that is easy and fast
	  - No guarantee in finding a solution, can even make problem more difficult
	  - Often developed from experience
	  - General purpose heuristics

Define the generate-test heuristic, the difference-reduction heuristic, the strategy of subgoal generation, and the strategy of incubation. Explain the	**Generate Test Heuristic** - Generating possible solutions and testing solution - Helpful when search space is small - Only option when you can't test how close you are to solving the problem **Difference Reduction Heuristic** (Hill Climbing)