

Lecture 1-2: The Hierarchical Paradigm

Reading: Chapter 2

Objectives:

- Describe the hierarchical paradigm in terms of the 3 robot primitives
- Understand the meaning of the terms: precondition, frame problem, open world assumption, closed world assumptions
- List advantages and disadvantages of the Hierarchical Paradigm
- Be able to use the STRIPS algorithm to solve robot planning problems to accomplish goals

The control of mobile robots is difficult because of 3 reasons.

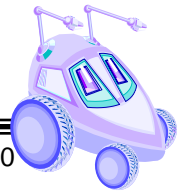
- a. _____
- b. _____
- c. _____

Compare and Contrast the differences between Classical AI Control and New AI Control

	Classical AI	New AI
Modeling		
Modularity		
Decomposition		

Control Architecture

The controller is the brains of the robot and the means by which sensing and action are coordinated. The control architecture provides the guiding principles and constraints for organizing the robot’s brain.



Feedback control is good for low level control of actuators, i.e.

- _____
- _____

Control Architectures are good for more complex tasks, i.e.

- _____
- _____

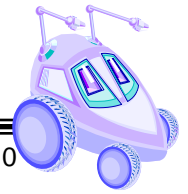
There are 3 types of control architectures:

- a. _____
- b. _____
- c. _____

The 3 types differ in the way they handle

- _____
- _____
- _____

The first AI-Inspired robot was _____ built at the Stanford Research Institute in 1970. It used AI techniques to recognize objects, plan a path to the object and push it over. W. Grey Walter's Tortoise was first but was not considered to be on the main branch of AI research.



- Sequential and orderly
- Robot **senses** the world and constructs a global map
- **Plans** directives to reach a goal
- **Acts** to carry out the directives (eyes closed)



Strips is a general problem solver that uses means-end analysis to reduce the difference between the robot's initial state and goal state.

Strips assumes a

_____ - everything the robot needs to know about the world to accomplish tasks is known. The robot does not function correctly if there is any unknown information in the world.

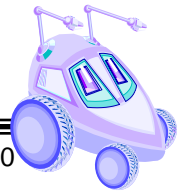
_____ - in order to provide the robot with everything it needs to know about the real world it is computationally intractable

Advantages of Hierarchical Paradigm

- _____ - works well for the intended application
- Provides an orderly relationship between the 3 robot primitives

Disadvantages of Hierarchical Paradigm

- Sensing and acting are disconnected
- Overdependence on the world model
- Frame problem
- Uncertainty in sensor noise and actuator (odometry) error
- _____ drawback



- _____ drawback
- _____ drawback

Plan Usefulness

- The environment cannot change during execution in a way that affects the plan
- The robot knows the state of the world at all times and how it relates to the plan
- The robot's effectors are accurate enough to execute each step of the plan

Name two robot systems that are ideal for deliberative (hierarchical) systems