Lecture 3-2: Designing a Reactive Implementation

Reading: *Introduction to AI Robotics* (Ch. 5)

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Objectives:

- Use schema theory to design and program behaviors
- Describe a complete behavioral system
- Draw a behavior table
- Define the terms: releaser, perceptual schema, motor schema for a behavior
- Describe the two methods for assembling and coordinating primitive behaviors
- Be able to represent a sequence of behaviors using a state diagram

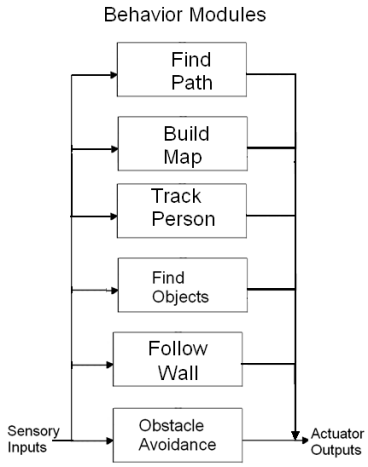
_____ is when a robot's small set of behaviors interact and combine internally to produce a higher level behavior that may or may not be predictable.

_____ are designed to take advantage of the emergent behavior that results from the interaction of basic behaviors.

Although a reactive system has parallel rules and behaviors that interact to produce emergent behavior, this may be rarely exhibited in _____ systems.

_____ is sometimes used interchangeably with reactive control because it does not contain any components of the deliberative (hierarchical) architecture or hybrid control.

An example of a behavior-based architecture which looks very similar to the _____ architecture is shown on the next page.

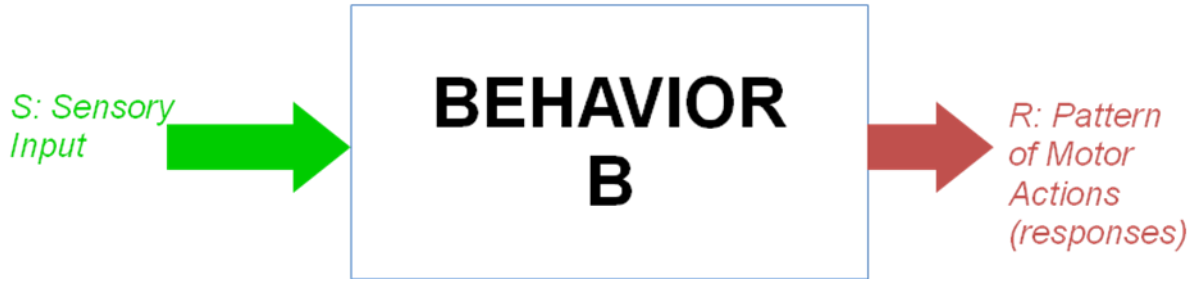


Behaviors achieve or maintain a particular set of goals and it may be time extended, not instantaneous such as wall following.

Behaviors can take inputs form sensors or other behaviors and send output to effectors or other behaviors (i.e. find object, retrieve object).

Behaviors more complicated than an action such as stop, turn left, turn right. Thus a behavior is the same as a reactive rule.

Behaviors can be ***primitive***, composed of only one perceptual schema and one motor schema or behaviors can be ***abstract***, composed of multiple perceptual schema and motor schema and/or other behaviors. This type of abstract behavior must include a ***coordinated control program.***



There are three methods for expressing robot behavior

Method	Diagram or notation
Stimulus-response (SR) diagram	
Functional notation	
Finite state acceptor diagram (FSA)	

A behavior is an object or ***class*** in object-oriented program where the perceptual and motor schema would be the ***data*** and ***methods***.

Behaviors are ***more complex*** than simple reactive rules and ***more flexible*** and can be used in clever ways to program robots.

A behavior table can be used to design a behavior-based control system with relationship to the releaser, motor and perceptual schemas.

The _____ are a set of mechanism that describe what a program should be doing at any given time, it can be represented as a ***table*** or state ***diagram***.

The two most common methods for ***coordinated control*** of behaviors are

- _____ is selecting one behavior or action (competitive, fixed or dynamic. i.e. subsumption architecture)

- _____is combining multiple behaviors or actions (cooperative, emergent behavior, may be logic or weight-based)