



# Introduction to Robotics

## CSE 461

Riad Ahmed

Lecturer, Dept. of Computer Science and Engineering

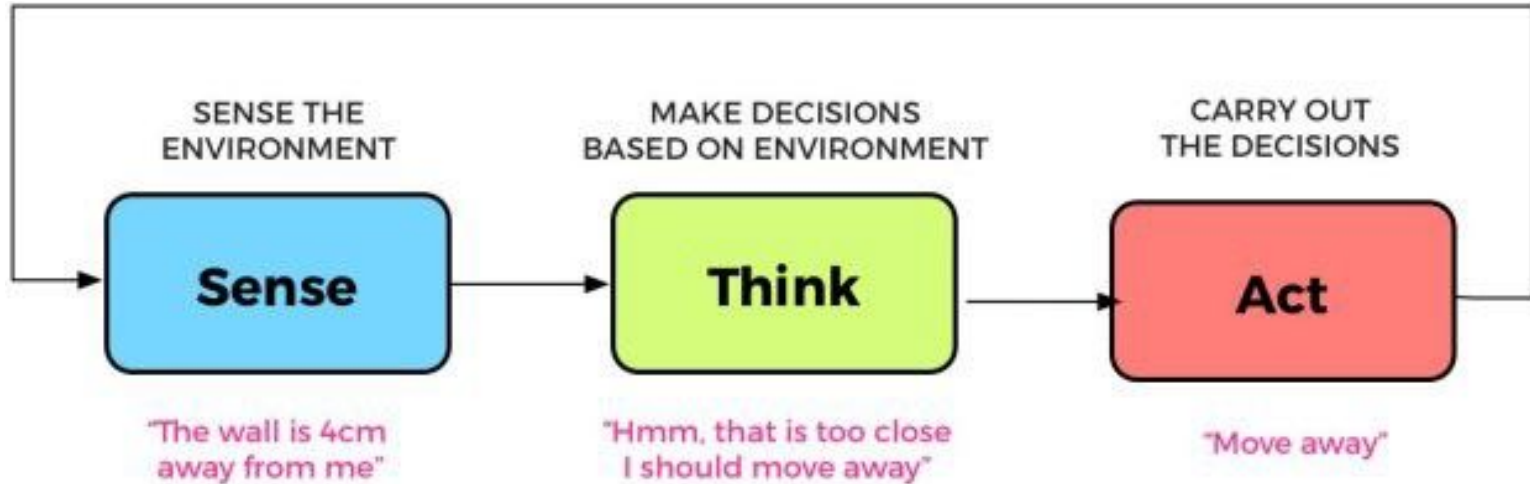
Brac University

Lecture 3: Chapter 1(Introduction to robotics: basics)

# Previous Class

1. Primitives

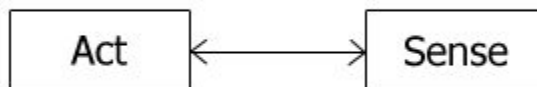
# Recall



# Paradigms of Robotics



# Reactive Paradigm



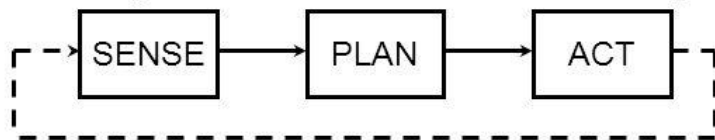
Robot Primitives	INPUT	OUTPUT
SENSE	Sensor Data	Sensed Information
PLAN		
ACT	Sensed Information	Actuator Commands

A diagram illustrating the flow of information between the SENSE, PLAN, and ACT stages of the Reactive Paradigm. The diagram is a table with three rows and three columns. The first column is labeled 'Robot Primitives', the second 'INPUT', and the third 'OUTPUT'. The first row is labeled 'SENSE' and contains 'Sensor Data' in the INPUT column and 'Sensed Information' in the OUTPUT column. The second row is labeled 'PLAN' and is empty. The third row is labeled 'ACT' and contains 'Sensed Information' in the INPUT column and 'Actuator Commands' in the OUTPUT column. A horizontal arrow points from 'Sensor Data' to 'Sensed Information' in the first row. A diagonal arrow points from 'Sensed Information' in the first row to 'Sensed Information' in the third row. A horizontal arrow points from 'Sensed Information' in the third row to 'Actuator Commands' in the third row.



# The Hierarchical Paradigm

S,P,A organization of Hierarchical Paradigm

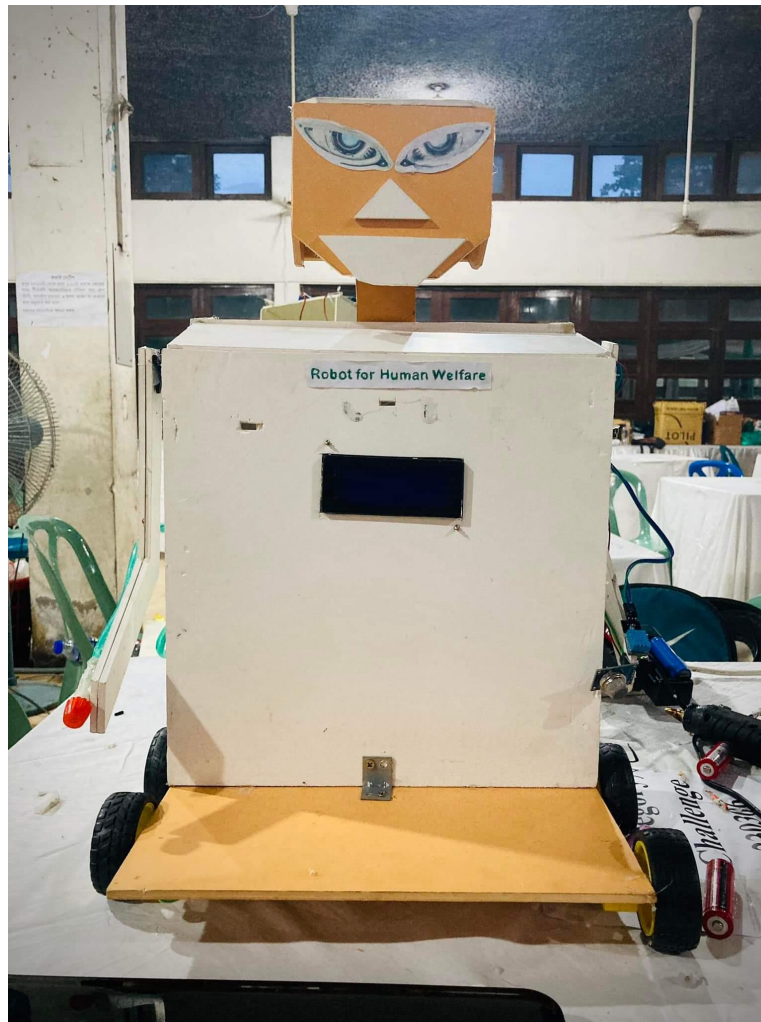


Alternative description of how the 3 primitives interact in the Hierarchical Paradigm

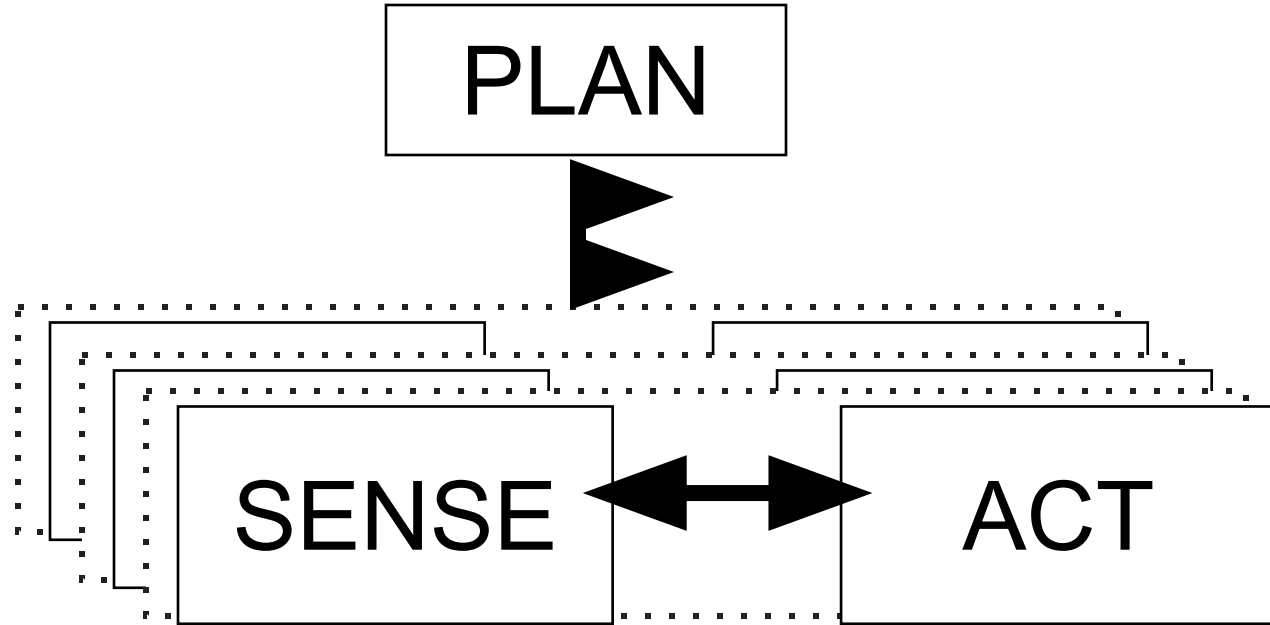
ROBOT PRIMITIVES	INPUT	OUTPUT
SENSE	Sensor data	Sensed information
PLAN	Information (sensed and/or cognitive)	Directives
ACT	Directives	Actuator commands

The table illustrates the interaction between the three robot primitives. Arrows show the flow of information: from 'Sensor data' to 'Sensed information' (under SENSE); from 'Sensed information' to 'Information (sensed and/or cognitive)' (under PLAN); from 'Information (sensed and/or cognitive)' to 'Directives' (under PLAN); from 'Directives' to 'Actuator commands' (under ACT); and from 'Directives' back to 'Information (sensed and/or cognitive)' (under PLAN). A thick black bar is present in the 'ACT' row under the 'INPUT' column, with the word 'Directives' written below it.





# Hybrid deliberative/reactive paradigm



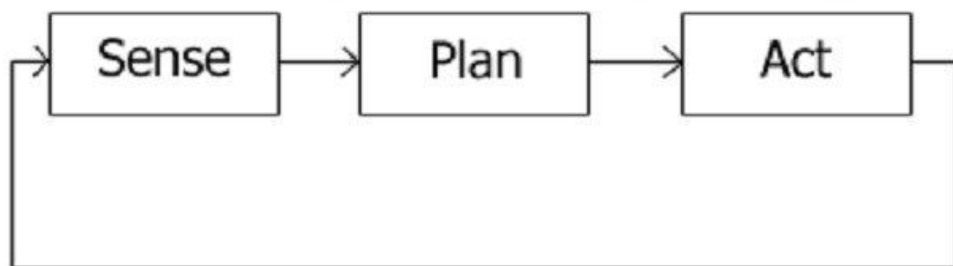
# Advantages

- Asynchronous processing technique allows to function Independently
- Planner can slowly compute next goal while robot can perform reactive task

# Local and Global Model

- Reactive for Local control
- Deliberative for Global control
- However; Robot behavioral management requires to know its current mission, state and environment beside path-planning, map-making, monitoring etc. So, both local and global models are required to be considered for a robot performance.

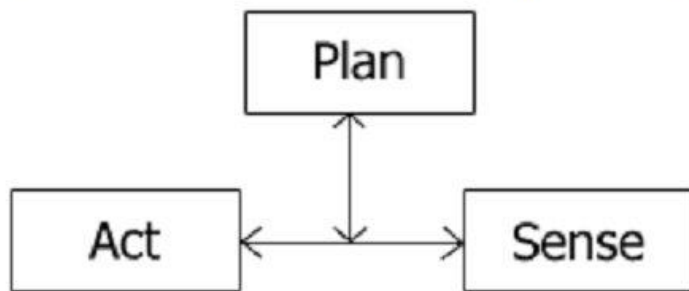
### Hierarchical/deliberative paradigm



### The reactive paradigm



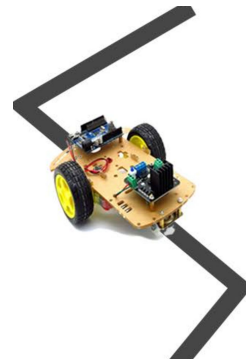
### Hybrid deliberate/reactive paradigm



# Group Activity

A : Line Following Robot

B : Mini Baymax



# Group Activity

A : Fire extinguisher robot

B : Baymax

C: Farm bot



# Let's talk about a dream !

<https://www.youtube.com/watch?v=fn3KWM1kuAw>



# Next Class

- Subsystem

Thank You