

The Hierarchical Paradigm

A robotic paradigm is defined by the relationship between three primitives:

- SENCE
- PLAN
- ACT

and by the way the sensory data is processed and distributed through the system.

The Hierarchical Paradigm (HP) is historically the oldest method of organizing intelligence in mainstream robotics. The paradigm dominated robot implementations from 1967 with the inception of the first AI robot, Shakey Figure 1 (see wikipedia entry: https://en.wikipedia.org/wiki/Shakey_the_robot, up until the late 1980's when the Reactive Paradigm emerged [1].

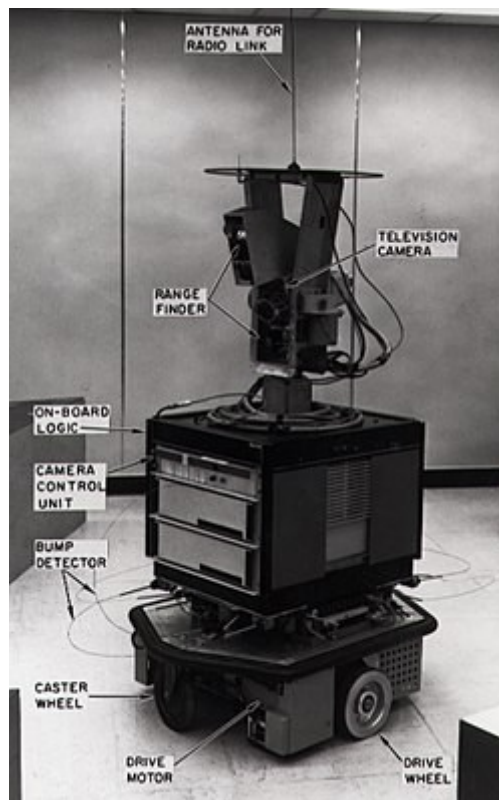


Figure 1: Shakey in 1972. Figure from wikipedia

The HP pattern is sequential with respect to the three primitives mentioned above. First the robot senses the world and constructs a global world map. Secondly, the robot plans all the actions needed to reach the goal. Thirdly, the robot acts to carry out the plans devised in the previous step. The sequence is repeated in a cycle. This is shown schematically in Figure 2.

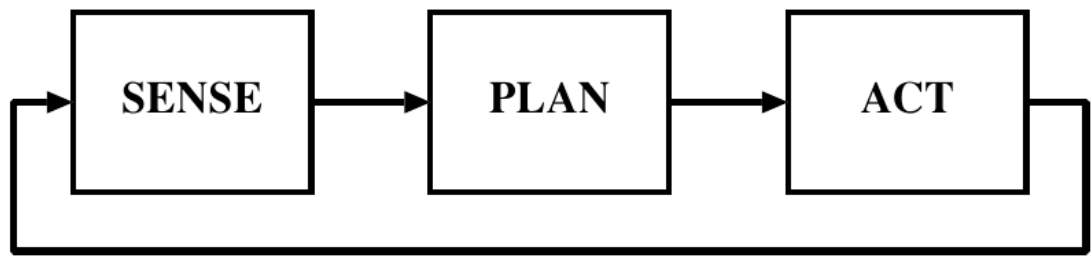


Figure 2: *SENSE-PLAN-ACT organization of Hierarchical Paradigm*

HP is monolithic in the sense that all sensor observations are fused into one global data structure which the planned accesses. This global data structure is generally referred as the world model.

Typically, the world model contains information about

- the representation of the environment the robot is operating in. e.g. a map of the building
- sensing information
- cognitive knowledge that might be needed to accomplish a task.

References

1. Murhy R. R., *Introduction to AI robotics*, MIT Press, 2000.