

AS-84.3146 Behavior-Based Robotics

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(You can answer either in Finnish or in English / Voit vastata suomeksi tai englanniksi)

1. Service Robotics

Robots in hospital environment: current status and future trends

2. Control Architectures

Name and define five main components of hybrid architectures in general.

3. Learning systems

The main problems when teaching a mobile robot with a Reinforcement Learning algorithm

4. Multirobot systems

Resource conflicts in multirobot applications

5. Finite State Automata(FSA)

The task

After the robot has been started by pressing the start button it should vacuum clean a square shaped room while avoiding obstacles by using its four infrared sensors. For simplicity sake, there is no need to separate different sensor value combinations in obstacle avoidance behavior. The vacuum cleaner starts automatically after the start button is pressed. The vacuuming algorithm should be based on random movements. The mission should last exactly eight(8) hours but the robot's batteries only last about one(1) hour. In order to stay operational for the whole mission, the robot has to be able to find a re-charging station (station is marked with a powerfull light source) and to connect itself to it. The energy loading will last 20 minutes. The mission is completed when the mission time is full.

The sensors

- Start button (SW): binary 1/0
- 4 infrared sensors (IS1-IS4) giving binary information 0=clear / 1=obstacle. Each sensor covers a quarter (90 degree) of the robot's surroundings.
- Mission Timer (MT), counts one tick per second
- Battery monitoring sensor (BM) giving binary information 0=energy OK/ 1=seek energy
- Re-charging station light detection sensor (RC_D) giving binary information 0=no station visible / 1=station detected
- Re-charging connection sensor (RC_C) giving binary information 0 = no connection / 1 = connected. Loading starts immediately after connection.
- Re-charging Timer (RT), counts one tick per second.

Based on the above task and sensor descriptions, make a FSA presentation for the application.