Sardar Vallabhbhai National Institute of Technology, Surat

CS 210 : ARTIFICIAL INTELLIGENCE

### LAB 2: INTELLIGENT AGENT & PROBLEM FORMULATION

INTELLIGENT AGENT

In the context of artificial intelligence (AI), an "agent" refers to a system or entity that is capable of perceiving its environment, making decisions or taking actions to achieve specific goals, and learning from its experiences. Agents are a fundamental concept in AI and are used to model intelligent behavior and interaction with the environment. An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators
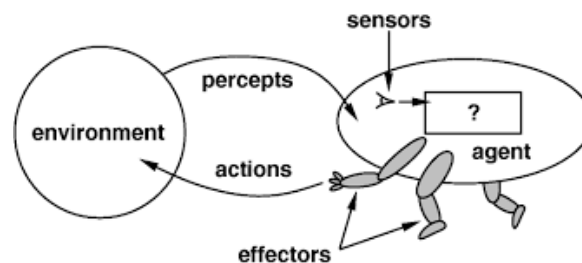
PART A : Introductory Problem

1. Mention and discuss the the preceptors (sensors) and the actuators for the autonomous mobile robot.
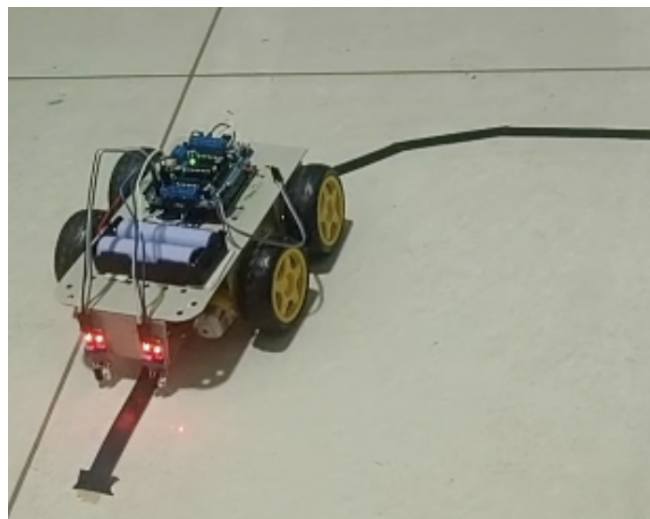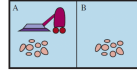
2. Consider the vacuum world scenario discussed in class. The only change is that instead of two rooms, there are four rooms (as shown below), one vacuum cleaner and a room may or may not contain dirt.

```
———————————————————
| Room 1 | Room 2 |
———————————————————
| Room 3 | Room 4 |
———————————————————
```

Inputs:
Write python/C program that takes four inputs through a single input file. First line of input file specifies the room number in which vacuum cleaner is located, second line specifies the presence or absence 1 or 0 of dirt in rooms 1, 2, 3 and 4, respectively, each separated by comma and third line in input file specifies the algorithm to be used :

dfs: Depth First Search
bfs: Breadth First Search

Assume valid actions as L,R,U,D,S,N where L=move_left, R=move_right, U=move_up, D=move_down, S=suck_dirt and N=no_op.

eg. In example in input file below (input.txt) vacuum cleaner is in Room 1, dirt is only in Rooms 1 and 4 and DFS is to be used in reaching to the goal state.
input.txt
1
1,0,0,1
dfs

```
python TA_4_5_P1_vacuum_world.py ''input.txt'' ''output1.txt''
```

Hints:
a) Your program should create an appropriate data structure (node) that can capture problem states.
b) Construct state space graph, identify nodes and vertices of this graph.
c) Based on the type of search algorithm, expand from initial state to next state and so on.
d) Once the goal is reached (i.e. no dirt in any of the rooms), program should terminate.

Outputs: Sequence of <current_room,action> pair until goal state (all rooms clean) is reached, output each sequence on a new line and save it into output file specified in fourth argument (say "out.txt" above).
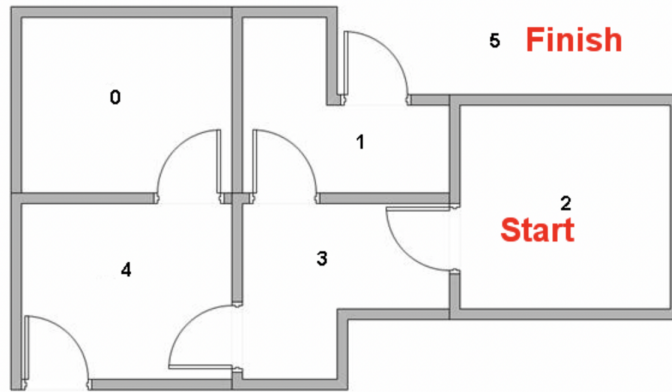eg.
1,S
1,R
.... and so on until goal is reached

Above output should be stored in output file, say "output.txt"

3. We have 5 rooms A to E, in a building connected by certain doors : We can consider outside of the building as one big room say F to cover the building. There are two doors lead to the building from F, that is through room B and room E.

Modeling the environment that can formulate the environment as an AI problem for finding the best possible path. Apply Breadth first search and Depth first search using C/Pyhton program.

INPUT: Starting state, Approach (e.g.: 2, DFS)

OUTPUT: 2-3-1-5 or 2-3-4-5

PART B : Exploratory Problem

3. Explore about the TonyPi Hiwonder Humanoid Robot. Identify the perceiving devices and actuators. Note down the steps to build the Humanoid Robot in the class.

4. Explore TurtleBot3 and Identify the perceiving devices and actuators. Note down the steps to build an autonomous Robot that can map the environment in the class.

5. Explore the sensors present in your mobile device. And which of them could be used in Human Motion Analysis.