4511W, Spring-2019
ASSIGNMENT 1 :
Assigned: 02/04/19 Due: 02/10/19 at 11:55 PM (submit via Canvas, you may take a picture of handwritten solutions, but you must put them in a pdf) <u>Submit only pdf or txt files</u>

Written/drawn:

Problem 1. (20 points)
Read this article: <u>http://spectrum.ieee.org/automaton/robotics/artificial-intelligence/how-google-self-driving-car-works</u> . Next describe the sensors of google's self driving car. Classify the environment based on the first 6 categorizations we went over in class (and are in the book) (you may skip known vs. unknown).

Problem 2. (30 points)
For each of the following scenarios, describe what are the possible (1) states and (2) actions for each state, along with the (3) cost of each action. Then answer (4) whether or not your implementation is complete-state or incremental (supply a short justification).

Situation 1: You traveled internationally over winter break and upon returning to Minneapolis, you forget where you parked your car in the long-term airport parking lot.   You know the car is on floor 3 and within the first third of the cars in a row, as you did not walk far when to reach the elevator.   You are tired from traveling and want to minimize the worst-case walking distance.

Situation 2: You accept the challenge to solve an "8-puzzle" on a 7x7 board! Given an initial state, you want to find goal state in the least number of moves.

Situation 3: You just donated a substantial quantity blood and want to have a large lunch. You go to a small grocery store (20 items, all over $1) and want to find the cheapest lunch that has over 1,000 calories and over 50% the DV for iron.

Problem 3. (30 points)
This problem is related to the two room vacuum cleaning example from class (and the book). You may assume dirt does not come back ever and want the vacuum to clean the room while moving as little as possible. The slides/book provide a simple reflex agent. (Note: we are not grading heavily on the quality of the algorithm you describe, but rather if you understand the difference between the classifications.)

(1) Provide a describe of a <u>model-based</u> agent that solves this problem.

(2) Provide a (loose) describe of a <u>goal based</u> agent that solves this problem.

(3) Provide a (loose) describe of a <u>utility based</u> agent that solves this problem.

Problem 4. (20 points)
For each of the following, state whether the task is being done rationally. Provide a few sentences justifying your choice. (Note: this is the strict artificial intelligence definition of "rational".)

(1) Humans playing chess. (The goal is to win and the humans know the rules.)

(2) A "dumb" Roomba that just cleans and moves forward until it hits an obstacle. The Roomba then turns a random direction. The goal is to clean a single room as quickly as possible. (You can assume the Roomba can perfectly aim and sense when it hits something.)

(3) A "smart" Roomba that has figured out a map of the room and zig-zags back and forth to clean it (see picture below). Specifically, you can assume the Roomba starts in the NW corner of the room and follows the wall to the E. When the E wall is hit, the Roomba will go S a bit (to not overlap its cleaning radius, yet not leave any area between unclean), then head back west (again parallel to the northern wall). Again the goal is to clean the room as fast as possible. If you are making any assumptions about the room or furniture, please state them.