BLG435E, Artificial Intelligence, Fall 2016-2017
Assignment #1

Due: Oct 28, 2016

Submission Type: An archive file including the softcopy report and the source codes for Q3 to be submitted using Ninova. Note that each student must work individually for this assignment. Team work is not accepted!

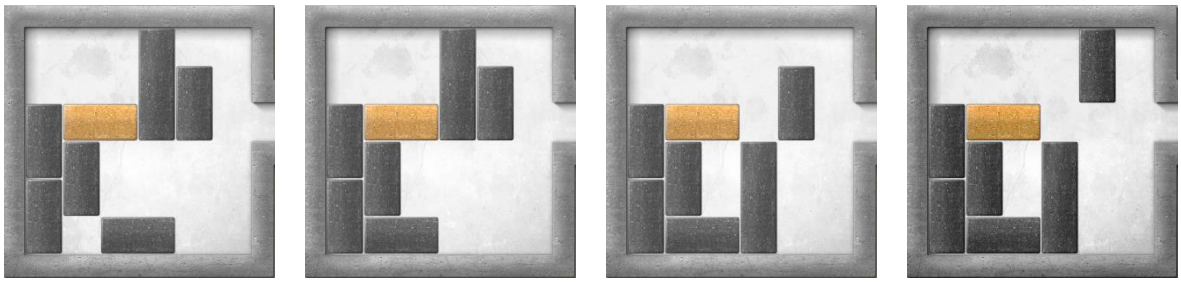
Q1 (25 pts) For each of the following agents, develop a PEAS description of the task environment:

- **(a)** Domestic service robot
- **(b)** E-mail sorting application based on preferences
- **(c)** Autonomous car driver agent
- **(d)** Activity recognition and anomaly detection software agent in an airport

For each of these agent types characterize the environment according to the properties of the environment (observability, dynamism, etc.) and determine the appropriate type of the agent architecture with reasonable arguments.

Q2 (25 pts) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent.

Q3 (50 pts) In this section, you are asked to solve the sliding blocks problem. In this problem, the objective is moving a target block out of the environment from an exit gate. The environment also contains different sized blocks as obstacles. Environment can be represented by a 6 x 6 matrix and the exit gate is on location [3,6]. To clarify the problem, an example illustration scenario of the game is given in the following figure.



(a) (b) (c) (d)

There are some constraints on movement of blocks;

- Blocks are either 1 x n or n x 1 sized rectangles. Here, n defines the length of the block and it should be greater than 1 (cannot be 1).
- 1 x n sized blocks can move along right/left directions.
- n x 1 sized blocks can move along up/down directions.

(a) Formulize this problem in a well-defined form and present your state and action representations in detail.

(b) Run tree search versions of both Breadth-first search (BFS) and Depth-first search (DFS) and analyze the results in terms of:

- the number of nodes generated
- the number of nodes expanded
- the maximum number of nodes kept in the memory
- the running time.

If any of the algorithms does not last, please specify the reason.

(c) Run A* algorithm with two different admissible heuristic functions and give a detailed analysis of the results in your report in terms of:

- the number of nodes generated
- the number of nodes expanded
- the maximum number of nodes kept in the memory
- the running time.

Important: In Q3, your solution can rely on existing BFS, DFS or A* algorithm implementations such as the ones provided for "Artificial Intelligence: A Modern Approach" book. However, you need to explain how the algorithms work in this problem and perform the requested analyses above with sufficient explanations in your report. **Code usage without relevant references will be considered as Plagiarism.**