University of Lincoln Assessment Framework
Assessment Briefing

Module Code & Title: CMP2020M Artificial Intelligence

Contribution to Final Module Mark: 50%

Description of Assessment Task and Purpose:

Part 1: A* Algorithm (30%)

To complete Part 1 of this assignment you should submit your completed code for the Pathfinding Workshop #3, which asks you to implement the A* algorithm as an extension of your version of Dijkstra's algorithm in your C#/SDL project. Complete the workshop as fully as possible, and submit your completed working code project as a .zip file.

Part 2: PDDL task (40%)

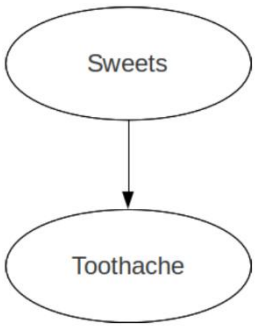
This task is to write a PDDL domain that can solve a planning problem for floor-cleaning robots. A set of robots has the task to clean floor tiles. The robots can move around the floor tiles in four directions (up, down, left and right). Robots have a brush mounted at the front and at the back, so they can clean in front and behind them (up and down, respectively), but they cannot turn around. The robots, however, cannot drive on wet surfaces, so they must never drive onto tiles they have already cleaned (and are therefore wet). Besides, a robot can not clean the tile where another robot is occupied. The task is to write a planning domain, which can solve this task for general environments. You should use the planning web service provided to you at http://lcas.lincoln.ac.uk/fast-downward/.

In the "Problem" section of that web service you find exemplary problem definitions (floor-problem-01 and floor-problem- 02), and in the "Domain" section you will find a skeleton PDDL domain for this problem (named floor-domain-template) .

Complete the domain skeleton so it solves the given problems (floor-problem-01 and floor-problem- 02). These problem definitions already define the configurations representing an environment. As hinted in the template, you need to define the preconditions and effects for six actions, namely up, down, right, left, clean-up, clean-down. Make sure, you name the actions precisely as asked for, or you will not be able to receive full marks.

Part 3: Bayesian network reasoning (30%)

Probabilistic Reasoning (medical expert system):
The following diagram shows a Bayesian belief network
representing what happens when you eat sweets, i.e, if you eat sweets you may have toothache.



The conditional probabilities are (where S=sweets and T=toothache):
• P(S)=0.2 probability of eating sweets
• P(T|S)=0.6 indicates the probability of having toothache after eating sweets
• P(T|¬S)=0.2 indicates probability of having toothache without eating sweets.

Please answer the following questions, and make sure you evidence your way of thinking by using the correct formulas:

1. Calculate the prior probability P(¬S).

2. Calculate the conditional probability p(¬T|¬S).

3. Calculate P(T), i.e the probability of having toothache.

4. Calculate the conditional probability P(S|T), i.e. which is the probability of having eaten sweets if you have toothache.

Learning Outcomes Assessed:

LO1 Explain the theoretical capabilities of Artificial Intelligence
LO2 Apply Artificial Intelligence techniques to solve practical problems

Knowledge & Skills Assessed:

programming skills, application of AI theory, independent working

Assessment Submission Instructions:

The deadline for submission of this work is included in the School Submission dates on Blackboard. You must make an electronic submission of your work to **Blackboard** the **Turnitin upload area** for assessment item 2.

Date for Return of Feedback:

Please see the School assessment dates spreadsheet.

Format for Assessment:
The format is a .zip file contains two pieces of codes and a report

Feedback Format:

Feedbacks will be provided to every student via blackboard.

Additional Information for Completion of Assessment:

Part 1 answers submission information:

The code for your A* implementation should be uploaded as a .zip file to the **supporting documents area** of Blackboard for assessment item 2.

Part 2 answers submission information:

Please download your completed pddl domain file by clicking the download button 

on the planning web service and upload this file to the **supporting documents area** of Blackboard for assessment item 2.

Part 3 answers submission information:

Please submit a pdf file which includes both the detailed calculation steps and answers to **Blackboard** the **Turnitin upload area** for assessment item 2.

The deadline for submission of this assessment is included in the School Submission dates on Blackboard. You must make an electronic submission of your work to **Blackboard** the **Turnitin upload area** for assessment item 2.

This assessment is an individually assessed component. Your work must be presented according to the School of Computer Science guidelines for the presentation of assessed written work. Please make sure you have a clear understanding of the grading principles for this component as detailed in the accompanying Criterion Reference Grid. If you are unsure about any aspect of this assessment item, please seek the advice of the delivery team.

Assessment Support Information:
Students can ask the delivery team or module demonstrators should they have any queries related to this assessment.

Important Information on Dishonesty & Plagiarism:
University of Lincoln Regulations define plagiarism as 'the passing off of another person's thoughts, ideas, writings or images as one's own...Examples of plagiarism include the unacknowledged use of another person's material whether in original or summary form. Plagiarism also includes the copying of another student's work'.

Collusion is defined as when a student submits work for assessment done in collaboration with another person as entirely their own work or collaborates with another student to complete work which is submitted as that other student's work. Collusion does not apply in the case of the submission of group projects, or assessments that are intended to be produced collaboratively.

Plagiarism and collusion is a serious offence and is treated by the University as a form of academic dishonesty. Students are directed to the University Regulations for details of the procedures and penalties involved.

For further information, see www.plagiarism.org