Assignment 2

Artificial Intelligence

CISC 352, Winter 2021

Introduction

This assignment is intended to gauge your understanding of planning and the PDDL modeling system. Your goal will be to implement a domain in PDDL as well as several problems that fall in that domain. You will be given a zip folder, pddl_template.zip, containing a template file for the domain as well as template files for the problems you are expected to implement.

Implement the following Domain and Problem set in PDDL.

Maximum group size for this project is 4. Minimum group size is 2.

The Domain – The Trapped Hero

A hero has woken up in a dungeon full of vicious monsters and deadly traps! Looking around, they gather the following easily apparent facts about the dungeon:

- The dungeon contains rooms that are **connected by corridors** (and can therefore be represented as an undirected graph)
- Each room can be **empty**, have a **monster in it**, have a **trap in it**, or have a **sword in it**.
- One of the rooms is the **goal** room; it has an exit, so the hero can escape.

The hero is lucky to have so much information about this dungeon! But they are not that lucky. The rooms are boobytrapped such that when the hero leaves a room, the room collapses on itself and **cannot be visited again**.

So long as the hero remains alive, they can perform any of the following actions:

- The hero can **move to an adjacent room** (connected to the current room by a corridor) that has not been destroyed (i.e., has not yet been visited)
- The hero can **pick up the sword** if the room the hero is currently in has one **and** the hero is empty handed.
- The hero can **destroy the sword they are holding** if they are holding a sword. If done in a room that has a monster or a trap, the hero is killed!
- The hero can **disarm a trap** if they are **not** holding a sword when they enter a trapped room. The hero **must be in the room with the target trap** to do this.

However, there are several constraints the hero is subjected to:

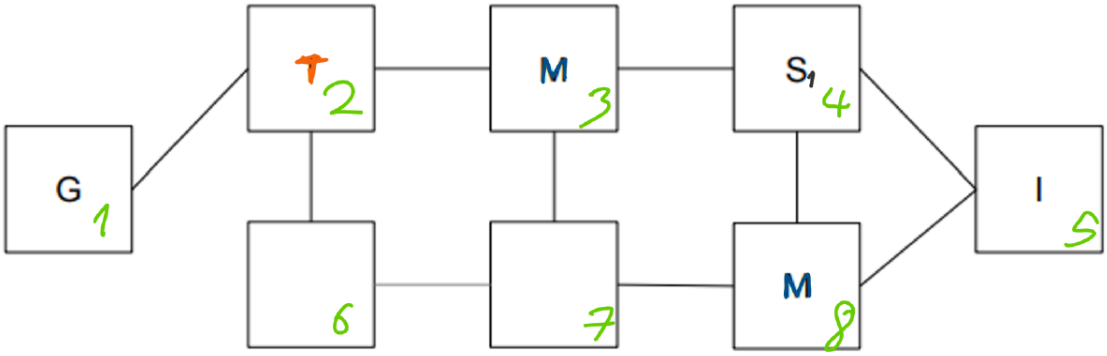
- The hero must be carrying a sword when in a room with a monster, or they are killed instantly. Note that the hero is a pacifist and **cannot** kill the monsters.
- If the hero destroys a sword in a room with a trap or a monster, they are killed instantly.
- The **only** safe action in a room with a trap that is not yet disarmed is to disarm the trap. Any other action, including moving away, kills the hero instantly!

Important: please read and reread the above until you understand it completely. Failing to understand the domain will significantly hamper your ability to succeed on this assignment!

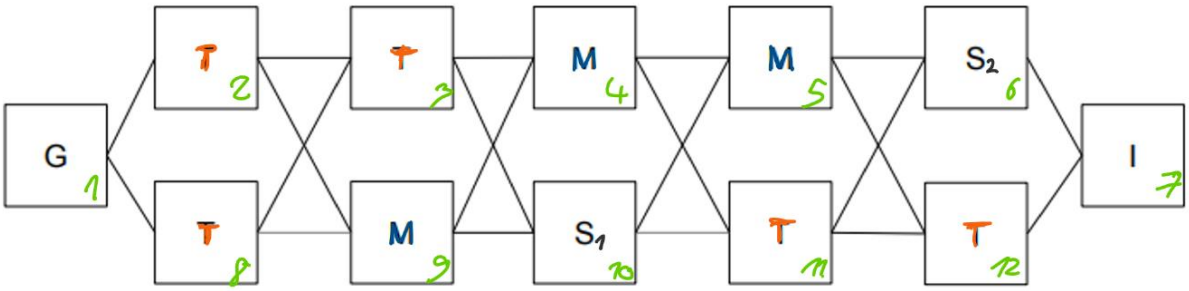
The Problems

The problems you need to implement are defined by the following non-directional graphs. The letter **G** indicates the goal room, the letter **T** represents a trap, $\mathbf{S_i}$ represents a sword, **M** represents a monster, **I** represents the initial starting position of the hero, and no letter represents an empty room.

Problem 1

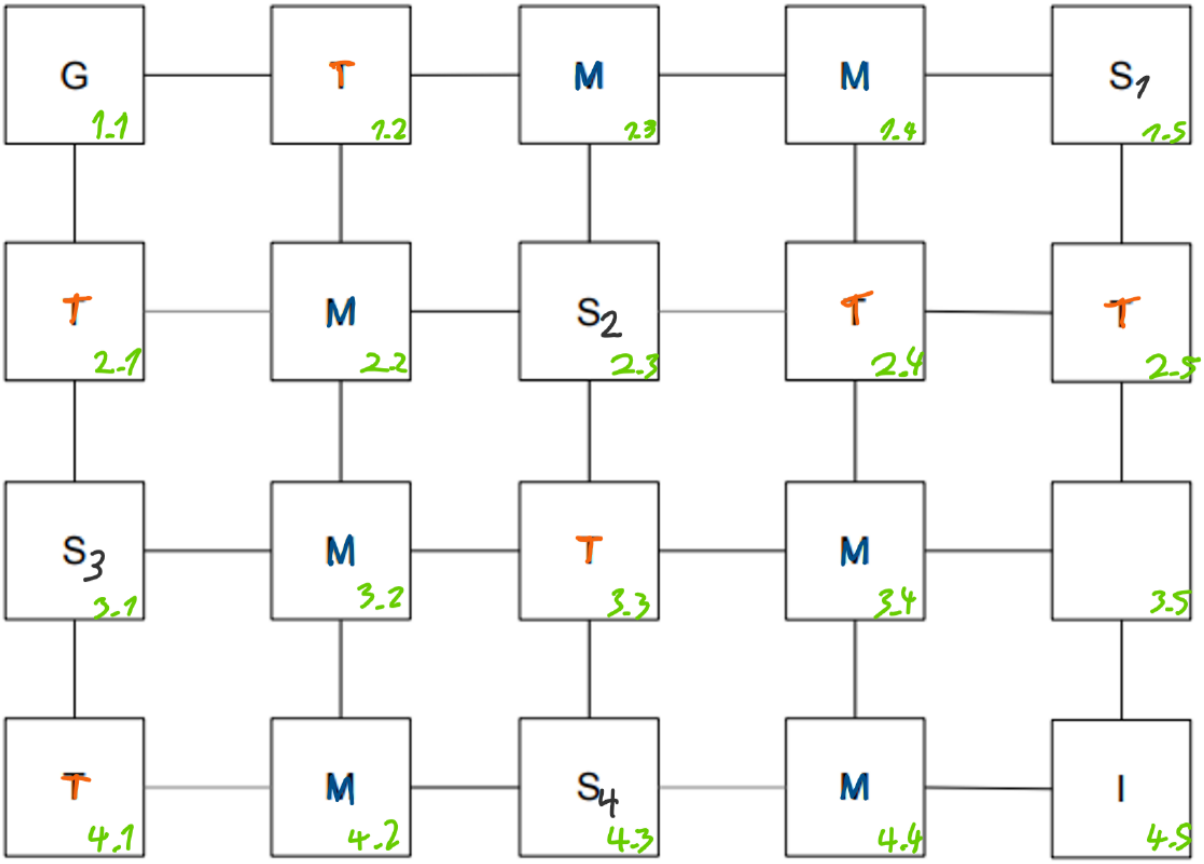


Problem 2



Problem 3 is on the next page.

Problem 3



Turning in This Assignment

In order to hand in this assignment, place your domain file and 3 problem files in a zip folder along with a .docx file, a .txt file, or a .pdf file containing the list of students who worked on the project, their student numbers, NetIDs, and a short description of who contributed what. Upload this .zip file to the assignment page on OnQ.

Rubric

This assignment is worth **12%** of your final grade in this course. Marks for this assignment will be distributed as follows:

- Correct encoding of the domain. **8% (2% per correctly implemented action)**
- Correct encoding of each problem. **3% (1% per problem)**
- Readability of submitted PDDL (indentation, comments, etc). **1%**

Useful Resources

Visual Studio and VSCode are recommended tools for this project, as they have excellent PDDL integration. Alternatively, go to editor.planning.domains in your web browser. Here is a video demonstrating the capability of both:

https://www.loom.com/share/16c132a5092d4bcd81944ddeb9e13176