

Open-World Adventure Game

MSAI 371 Knowledge Representation and Reasoning Project Report

Liqian Ma, Qingwei Lan, Wentao Yao

March 7, 2022

1 Introduction

[1]

2 Game Details

In this section, we will explain the details of the game and all the systems we built. We will also explain how we encoded knowledge and how we utilized the reasoning engine to perform tasks with the encoded knowledge.

2.1 Map System

We have a map with a predefined size like 10×10 . At each coordinate, we have the following objects as shown in Table 1.

Object	Visual	Explanation
empty	0	walkable spot
wall	1	not walkable
start	2	hero starts adventure at this location
gem	3	if found, the game ends and hero wins
rock	4	initially not walkable, but can be broken
peril	-M	a negative number indicates a peril (monster)

Table 1: Table of map objects, their visual representations, and explanations.

Visual Representation of Map

The map can be represented visually, shown below.

[
[2, 0, -5, 0, 1, 0, 0, 0, 0, 0],
[1, 0, 0, 3, 1, 0, 1, 0, 0, 1],
[0, 1, 0, 0, 1, 0, 1, 1, 0, 1],
[0, 1, 0, 0, 1, 0, 1, 0, 0, 1],
[0, 1, 0, 0, 1, 0, 1, 0, 1, 0],
[0, 1, 0, 0, 1, 0, 1, 0, 1, 0],

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[0, 0, 1, 0, 1, 0, 1, 0, 0, 0],  
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0],  
[0, 0, 0, 0, 1, 0, 0, 0, 0, 1],  
[0, 0, 0, 0, 0, 0, 1, 0, 0, 1]  
]
```

We built a system to automatically infer the map objects based on this visual representation. This system is one of the most complicated reasoning systems in our project.

We need to process each cell (row and column) to extract the object from the visual representation and insert the object as a fact into our knowledge base. Some objects (walls) cannot be changed and need to be represented statically. Other objects (Gem) can be removed from the map and need to be represented dynamically.

Knowledge Encoding: The map consists of facts inserted into the knowledge base.

Reasoning: The objects at each location are inferred from the visual representation of the map.

References

[1] Jan Wielemaker, Tom Schrijvers, Markus Triska, and Torbjörn Lager. Swi-prolog, 2010.