TECHNICAL REPORT CSINTSY S13

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I. Gold Miner Agent Goal

The goal of the Miner agent in the Gold Miner maze is to either be able to find the Gold Square of a Beacon that will help lead the Miner towards it. The Miner will systematically go over through the maze while scanning each square at all unvisited directions while going towards its goal. The agent uses a mix of both backtracking and memory in knowing which squares the Miner should go towards and which squares are not needed to move towards again. The goal is met in two ways: if the Gold Square is found then the goal is attained and the game ends with the current statistics. The other way is for the Miner to land on a Beacon with an output that is not 0, and then the miner will check all 4 sides in order to find the Gold Square, which gradually lends itself to achieving the goal via trial and error.

II. Problem Formulation

The problems present in the Gold Miner Maze are namely the pits that the user inputs during Maze generation, as well as the positioning of both the Gold Square and the Beacon square that is also generated by the user at start. The objective of the maze is to be able to either reach the Beacon block in order to find the straight path towards the gold, or to find the Gold Square without the Beacon. The Beacon as a part of the maze is a secondary objective that helps solve the problem as it narrows down the solution to the problem, which is the location of the Gold Square, into one of four possibilities. Yet, even without the Beacon can the problem be solved by simply stumbling or making educated guesses as well as scanning for the Gold Square without the aid of the Beacon.

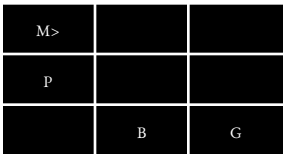
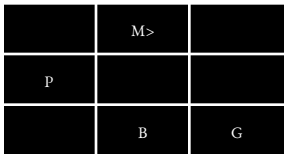
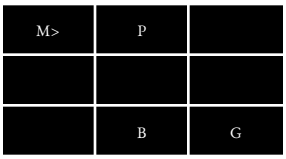
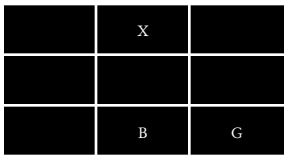
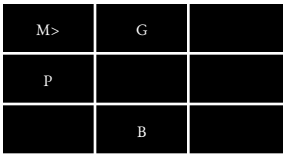
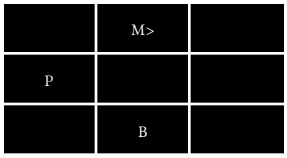
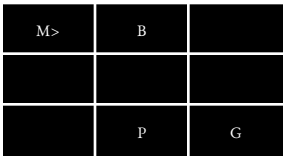
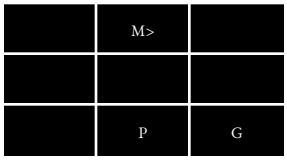
III. Specific States and Configurations

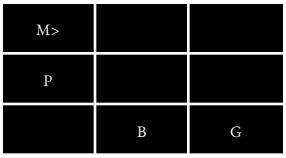
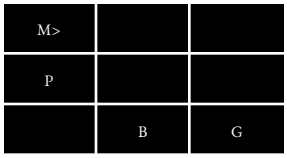
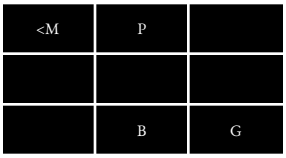
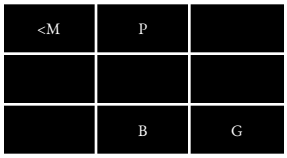
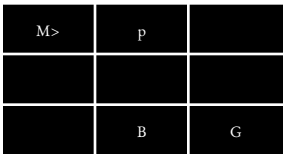
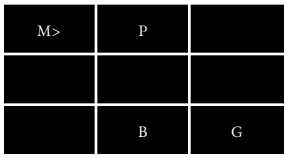
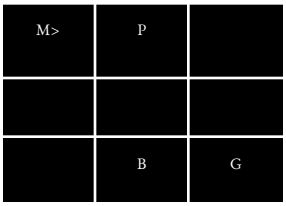
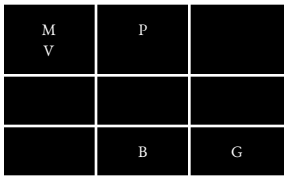
As per the Project Requirements, the Agent is designed to operate on a grid with a size varying between 8 - 64. The Miner works by traversing said grid that should have a Gold Square and a Beacon that leads towards it, although the inclusion of Beacons that are unaligned towards the Gold Square, as well as the exclusion of Beacons in a certain grid design is also valid, in which case the Miner will purely focus on finding the Gold Square. The Miner is also designed to operate on a grid with pits, which are tiles in which traversing through them would result in a loss, thus the Miner is designed to scan for any pits in order to avoid traversing through them.

The Miner is designed to work in different Configurations or board states. These Configurations/States are explained in detail below:

1. **Normal Configuration** - in a normal configuration, the Miner operates normally and traverses the grid in search for the Gold Square or towards a Beacon that will lead to the Gold Square
2. **Trapped Configuration** - in a configuration wherein either the Miner or the Gold Square is blocked off, the Miner will first scan and traverse the entire available tiles it can cross, and once the entirety of the grid accessible to the Miner has been scanned and traversed, the verdict that the Gold Square is unreachable will be shown
3. **Misaligned Beacon/No Beacon** - in a configuration with no Beacons in the grid, the Miner will focus purely on traversing and finding the Gold Square without the aid of a Beacon to lead the Miner towards it. In the event of a Beacon that is not aligned towards the Gold square, or a Beacon that returns the value of 0, the Miner will simply ignore the Beacon and continue traversing in search of Gold.

IV. Specific Actions, and the States Configurations

Action	Applicable Configurations	Current State	Next State
Move	Path in front of Miner is untraversed and open		
Move	Path in front of Miner is a Pit		 Console prints :`It Ded! You Lose!`
Move	Path in front of Miner is Gold		 Console prints : `Gold Block Found!`
Move	Path in front of Miner is a Beacon		 Console prints : `Beacon Hint: 0`

Scan	Path in front of Miner is Empty		 Scan Result : Null
Scan	Path in front of Miner is Out of Bounds		 Scan Result : Out of Bounds
Scan	Path in front of Miner not Empty		 Scan Result : P
Rotate	Any Configuration		

V. Goal State Specification

The Goal state is properly determined by the Miner if the Miner is able to land on the same coordinates as that of the Gold square. The Miner searches for the Gold square through remembering what tiles it has stepped on before and through backtracking to cross new paths. The goal state is determined and achieved through two ways : Firstly, the Miner is able to manually trek throughout the grid and stumble upon the Gold square by scanning and moving towards it, thereby winning the game. The second option is for the Miner to find a Beacon, and if the Beacon returns a value greater than 0, then it will then look towards all possible directions as to where the gold is located. An example of this is if the Miner were to have an x coordinate of 9 and a y coordinate of 8, while the Gold Square having an x coordinate of 9 and a y coordinate of 8, making them have the same coordinates, thus meaning that the Miner has reached Gold.