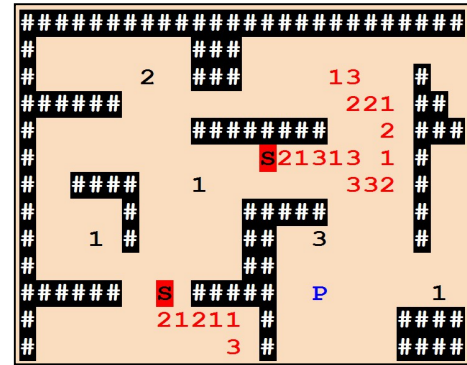


Code / Project : CME1252 / 2
Year / Semester : 2024-2025 Spring Semester
Duration : 8 weeks

Project: Number Snakes

The aim of the project is to develop a robot/snake maze game, in which treasures are collected while walking in it.



General Information

The game is played in a 23*55 game field including outer walls. There are two competitors: Human Player (P) and Computer (C). There are some treasures/numbers in the game, which the players collect to increase their scores. The aim of the game is gaining the highest score.

Game Elements

P : Human player

- Cursor keys: To move the human player (in 4 directions)
- Space: To drop a "trap device" in the direction of the player
- Player has an energy for quick movement (4 times faster).
- Player is uneatable by computer robots, but can be harmed.

C, S : Computer controlled robot enemies

- Computer controls all C and S robots.
- C and S robots select a random treasure as a target.
- Robots cannot chase the player on purpose.
- There is only one C robot. It cannot be harmed. It uses pathfinding to go to the target. C's targeted path will be marked in the game area.
- S robots have 2 move modes. In targeted move mode; it tries to go to their target directly (coordinate guided robot). They are stuck on obstacles. When it is stuck, it uses random move mode.

Treasures/Numbers : 1, 2, 3

- These can be collected by the human player or the computer robots.
 - **1** : 1 score point (and 50 energy points for the human player).
 - **2** : 4 score points (and 150 energy points for the human player).
 - **3** : 16 score points (and 250 energy points for the human player).
- Treasure energy points are only for human player. Computer robots cannot get or use energy points.

@/= : Magnetic trap device

- Trap device is in two forms: Packed (@) and used/active (=).
- Packed trap device can only be collected by the human player or C Robot. They come through the input queue and are located in a random position.
- Player can use a packed trap device by pressing the space key, if he/she has any. Collected trap device by a C robot, gives only score points to the computer player. Computer cannot use trap devices.
- Active trap devices eliminate S robots (So, they disappear).
- Computer S Robots cannot detect/avoid trap devices.
- Active trap devices do not affect Human player or C robot.
- Trap devices have an effect area (trap area): Square of the device and 8 neighboring squares (total 3*3 area).
- Trap devices have a duration: They are active for 10 seconds after activation, then they disappear.

Input Queue

The treasure numbers (1-3), trap devices (@) and S Robots are inserted into the maze area from an input queue. The input queue (size of 15 elements) is always full of elements, and shows the next element which will be inserted into the maze. The first element in the queue is inserted into the maze, at a random place in every 2 seconds.

Collision of Two Snakes (in targeted or random move mode):

- If the collision is head to head (S to S), both snakes disappear.
- If the collision is not head to head
 - If the hitter snake hits number 1 on the other snake, the hitter snake joins the other snake.
 - If the hitter snake hits number 2 or 3 on the other snake, the hittee snake divides into 2 parts. The hitter snake reverses itself. The second part of the hittee snake reverses itself too.

Action	Before	After
Eating	1 212231S2	1 2122312S
Reversing	##### 212231S# #####	##### S212231# #####
Collision Hitting 1	2122112S S 333	2122333112S
Collision Hitting 2 or 3	2122212S S 333	S2122 212S S333

Timing

Time unit of the game is 100 ms (approximately).

- Quick P (It needs 1 energy for each move): In every 1 time unit, P can move one square.
- Normal P (If P has no energy): In every 2 time units, P can move one square.
- In every 4 time units, each enemy robot (C or S) can move one square.
- New input queue element is inserted into the maze in every 2 seconds (20 time units).
- Neighboring square harming is based on 1 time unit.
- Displayed time in the screen is based on seconds.

Player's quick movement is 4 times faster than robots. When the player has no energy, the player loses the quick movement ability temporarily and can move only at normal speed (2 times faster than robots).

Neighboring Square Harming

Some elements harm other elements in the game when they are neighbors. Neighboring is in 4 directions, not in diagonals. If a C robot reaches any 4 neighboring squares of P, the player loses 30 life points. If the player has neighbor S robot parts (head or body), each neighboring part gives 1 life point harm to the player in 1 time unit. If the player loses all life points, game is over.

Scoring

When the human player reaches a number's square, he/she takes the number's score points and energy points. When the computer robots reaches a number's square, computer takes the number's score points. When a snake is trapped, human player gets 200 score points. When a C Robot gets a packed trap, computer gets 50 score points.

End of the Game and High Score Table

If the human player loses all life points, the game is over. After the game finishes, High Score Table is displayed in descending order.

Default High Score Table for the game (in the following order in "highscore.txt" file):

- Sevgi Yol 2000
- Tarkan Yolcu 3250
- Ali Deniz 160
- Deniz Okyanus 900

Data Structures

Input Queue: Queue

Pathfinding: Stack

Snakes (S Robots): Singly Linked List

High Score Table : Doubly Linked List

Suggested Weekly Program

1. Discussing and designing solution alternatives. Designing classes.
Creating the necessary variables, structures. Menu. Screen. Load operations.
Determining the team leader. Planning task distribution and scheduling.
2. Human player (P) movements (quick and normal). Timing. Input queue implementation. Treasures. Traps.
3. C Robot movement. Pathfinding. Targeted path marking.
4. Snake targeted and random movements (only head). Trapping. (---First Evaluation Week---)
5. Snake eating action. Snake targeted and random movements (full snake). Snake reversing.
6. Snake collisions (Hitting 1).
7. Snake collisions (Hitting 2 or 3). Human player neighboring square harming.
8. High Score Table. Remaining parts of the game. Testing/Debugging. (---Final Evaluation Week---)

First Evaluation: 16.5.2025 Report: 16.5.2025	Final Evaluation: 13.6.2025 (powerpoint + video) Report: 13.6.2025
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