Racing Game

Course Project for COMP406
Introduction

- Have you ever heard of Mario Kart before? In Mario Kart, the winner is the player first arrive the destination.

- Players can control one of cars with different kinds of characters. For instance, some cars are faster than others but much easier be attacked so that Players can trick others or strengthen themselves.

- Now, in our group project, you need to use AI algorithms to play the simplified racing game.
Overview

E: End
X: Block
O: River
S: Start
Players

Heal Point
Attack
Gold
Gun
Shell
Accelerator
Waterproof
Equipment

- **Basic Equipment**
  - 5 heal points
  - Attack
  - Move 1 step each term

- **10 Units of gold (10 g)**

```plaintext
default_g = 10;
default_hp = 5;
default_attack = 1;
default_movement = 1;
```
Equipment

- You can get more equipment using gold
  - Gun (cost 1 gold)
    - Your attack deal 1 extra heal point
  - Shell (cost 2 gold)
    - You have 5 extra heal point
  - Accelerator (cost 3 gold)
    - You move 1 extra step (same direction) each term. If you buy too much accelerator, your character could not turn round easily
  - Waterproof (cost 1 gold)
    - You can pass though river by equipping a waterproof
1. The judge will randomly choose a map
2. The judge will call player’s start function one by one.
   • You can use start function to initial your equipment
     
     function [gun, shell, accelerator, waterproof] = start(pid, players, map)
3. Judge will give all players – variables in judge.m:
   
   pid: your id
   players: vector which save all players’ information.
   e.g. players= [X, Y, Gold, Attack, HP, Speed, Waterproof, Buy_Finish]
   map: store the matrix of map in this game

4. **You should read the map, formulate your strategy, and decide what equipment to buy.** And implement it in start.m
Game Flow – Initialization

An example of start.m

```matlab
function [gun, shell, accelerator, waterproof] = start(pid, players, map)

if players(pid, 3) == 10
    gun = 0;
    shell = 4;
    accelerator = 0;
    waterproof = 1;
else
    gun = 0;
    shell = 0;
    accelerator = 0;
    waterproof = 0;
end
```

You have and only 10 gold. If you buy equipment using more golds, you will be punished.

Which means you want to buy 0 guns, 4 shells, 0 accelerators and 1 waterproof.
Game Flow – Moving

- You need to implement another function `term function` in `term.m`

  ```
  function [operation] = term(pid, players)
  ```

- You should choose either one of following to the judge:
  - operation = ‘wait’
  - operation = ‘north’
  - operation = ‘east’
  - operation = ‘west’
  - operation = ‘south’
Game Flow – Moving

- An Example of term.m

```matlab
function [operation] = term(uid, players)

% Know others' position and status
operation = 'north';
end
```

Move to north for all terms. You can apply different strategy for different situation.
Game Flow – Moving

- **north/east/west/south**
  - Move your character one or more steps north/east/west/south.

- **wait**
  - Stop and wait for attacking: If there are other players moving into the cell, all of them would be attacked twice.
  - If 2 players wait in one cell, both of them would be attacked twice.
Game Flow – Moving

B wants to enter the cell where A locates
The term of A is ‘Wait’
The term of B is to enter the cell
In this case, B will be attacked by A twice, and A will only be attacked by B once, because A has more energy after wait session

A and B are in the same cell.
The terms of both A and B are ‘Wait’
In this case, A and B will be attacked by each other twice
Game Flow – Settlement

- Once,
  1. Your player dies.
  2. One of the players is in the end point.
  3. Number of terms is over 100.

The game will enter end phase and the judge will calculate players’ score.
Your initial score is 0.
- Attack other and deal other 1 healing point: +1 point
- If your character die: -10 points
- If the length from your character to end point is n: - n\log_2(n) points
Score Board

% Calculate the score for each player
for i=1:num_player,
    length = sum(abs(players(i,1:2) - end_point));
    if length > 0
        scores(i) = scores(i) - length * log2(length);
    end
    if players(i, 5) <=0
        scores(i) = scores(i) - 10;
    end
    disp([('Player', num2str(i), ' got ', num2str(scores(i), ' scores.'))]
end

Length from your current position to destination
Time Constraint

- For reading map, formulating your strategy and selecting equipment, i.e., start function - 22s

\[
\text{if}(\text{start\_time\_total}(i) > 22)
\]

\[
\text{players}(i, 8) = 0; \quad \% \text{start function exceed the time limit}
\]

- For each term -5s

\[
\text{if}(\text{end\_time} > 5)
\]

\[
\text{operation} = \text{'wait'};
\]

end

“toc” function is used to Read the stopwatch timer
Game Rules

1. All players decide one and only one operation which your character to do each term.
2. If the operations is invalid, the judge will choose wait for your character.
3. Players will not know others' decision.
4. After all players made decision, the judge will calculate the result and end the term.
5. While the term end, if 2 or more characters stay in the same cell, all characters would be attacked by each other.
6. Character cannot attack in the start point or end point.

7. The game will be end while any character reach the end point.

8. Once you are attacked, you would lose heal points which equals to the attacker's attack point.

9. If your heal point equals to or less than zero (dead), your character cannot do any operation unit end game.

10. All player would know others’ position and status.
## Time Plan

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Thank You