GuardAIns

Overview

GuadAIns is a Guardians of the Galaxy-themed AI tournament. As troops, each participant will have all five guardians. Each team must locate the power stone that exists in that arena. In this game, both players will make their moves at regular intervals of time at the same time. There may be numerous clues, teleporters, heal points and so on. To win the game, the player must find the power stone and return it to their base, or eliminate all of the opponent's guardians.

Objective

Navigate the map with your five guardians in order to find the hidden power stone and return it to your base. In order to find the power stone, use your guardian's abilities, clues, and teleporters while keeping an eye out for opponents. The player who returns the power stone first before the game ends will win the game.

Environment

This game features a 200 * 200 matrix of cells where all the troops can move. Each cell of size 1*1.The cells are separated by walls, and a troop can move from one cell to another, only if there isn't a wall in between. This matrix will be generated dynamically for each game with a power stone in a random cell.

Each player will have a base position where the player's guardians will start and the power stone should be returned to the base to win the game. Each guardian will have been placed at their base position initially. The base position for player 1 could be anywhere in the first column(i.e x=0, y=rand()), similarly the base position for player 2 could be anywhere in the last column(i.e x=199, y=rand())

Each cell is of the following type:
- **Empty:** Empty cell does nothing
- **Clue:** 2 types of clues
    - Direction to the power stone.
    - Locations of each enemy guardian at that instant.
- **Beast:** A beast will incur a damage of -25 to the troop, but attacking a beast will provide a clue(one out of the 2 types of clues)
- **Teleporter:** A teleporter can teleport the troop to any random cell in the arena which is closer to the infinity stone when compared to the current position.

- **Heal points:** A Healer recharges your health to 100% if you stay at that position for 5 rounds. If you choose to move away from that position before the 5th round, then health won't be increased.

Troops

Each player has all 5 guardians in his/her troop.
The 5 guardians being **Drax**, **Groot**, **StarLord**, **Rocket**, **Gamora**.
Each of the guardians has its own initial health and fixed attack power, vision, speed, cooldown and special abilities which can be found in the table below.

You can choose to attack an enemy if he is in the range, but at the same time if the enemy chooses to move and he manages to leave your range, the attack will be a miss. If he also chooses to attack you, then both of your shots will be hit.

	Drax	Groot	StarLord	Rocket	Gamora
Health	150	200	100	75	125
Attack	70	25	35	35	50
Vision	1	2	5*	4	2
Speed	1	1	2	3	2
Cooldown	3	-	-	-	3
Special Abilities	Break Walls	Regeneration +5 (increase in health) per round	See through Walls	Definite Attack/ Lockon attack**	Jump anywhere within the radius of 5#

*vision for StarLord increases because of his special ability(to see through walls)
**When Rocket uses its special ability then the Moving > Attack priority does not hold. This means if Rocket attacks and uses its special ability, the guardian being attacked cannot escape!!.
#Here Gamora will have the ability to jump anywhere in the radius of 5 but will not be able to see beyond 2(due to her vision constraint!).
If the troop moving/attacking are the **same** then the below priority is considered
Attack/Moving Priority: Moving > Attack

Definitions
1. **Health:** This indicates the initial health of the guardian

2. **Attack**: This number indicates the amount by which the health of the guardian being attacked gets decreased. There is only one target cell for the attack.
3. **Vision:** This number indicates the number of cells the guardian can see. It also represents the attack range of the guardian.
4. **Speed:** It indicates the number of cells the guardian can move.
5. **Cooldown:** This represents the number of rounds the guardian needs to wait before using its special ability again. Note that cooldown exists only for **Drax** and **Gamora**. All other guardians can use their special abilities without any restriction.

Rules
- Prefered Programming language of this event is **Python**
- The game should be played entirely by autonomous programmes and should not require any human intervention. Failure to obey will result in disqualification.
- Every Team must register before **01st March, 2021** are eligible to participate in the game.
- The decision of the organizers and/or judges shall be treated as final and binding on all
- Note that at any point in time the latest information will be that which is on the website and all decisions will be made in accordance with that..
- The originality of work is essential, and your team will be disqualified if found otherwise.

Programming Guidelines

The player should develop a python program which can autonomously play the game without any user interaction. During the game, the program will be running on the player's computer and the program will communicate with the game server using socket communication with the help of **socket.io** library.

Initially the game server will create games with unique mazes and place the player's guardians on one side of the maze. Both players will be placed on opposite sides of the arena. Each player needs to connect with the game server with valid room_id, player_id, password. Each player will be given these credentials before the game starts. Listen over **'game_status'** event to get updates regarding game status.

After Connecting Successfully to the game server, the players need to wait until the game starts. On start each player gets pinned on an **'action'** event with some data about the environment state and information regarding the guardians and their vicinity.

The data the you get will be in a fixed format as specified here

- Movegen: Current coordinates, health, neighbour cells (cells that are in range of vision for a guardian) of each of your guardians that are alive.
- Feedback: Information of what happened in the previous round i.e events like invalid action, guardian attacked, guardian died etc..
- penalty score: A score that is initialized to a positive number and it will be reduced on each of your invalid actions sent by the player.
- round_no: Round number of current round.

The information will be given in this json format: can be found here

```json
1  {
2      "movegen":
3          {
4              "guardian_name":
5                  {
6                      "health": "health-int",
7                      "cool_down": "cool_down-int",
8                      "current_cell":
9                          {
10                             "coordinates": "(x,y)",
11                             "cell_type": "cell_type-str",
12                             "is_powerStone_present": "is_powerStone_present-bool",
13                             "guardians_present": [
14                                 {
15                                     "belogns_to": "belongs_to",
16                                     "guardian_name": "guardian_name"
17                                 }
18                             ]
19                         },
20                         "neighbour_cells" :
21                             [[
22                                 {
23                                     "coordinates": "(x,y)",
24                                     "cell_type": "cell_type-str",
25                                     "is_powerStone_present": "is_powerStone_present-bool",
26                                     "guardians_present": [
27                                         {
28                                             "belogns_to": "belongs_to",
29                                             "guardian_name": "guardian_name"
30                                         }
31                                     ]
32                                 }
33                             ]]
34                 }
35         },
36     "feedback":
37         {
38             "code": "codestring",
39             "message": "messagestring",
40             "data": "dataobject"
41         },
42     "penalty_score":  "int",
43     "round_no":  "int"
44  }
```

Values
- **coordinates:** string of coordinates tuple.
- **cell_type:** Type of the cell - cell(normal cell), teleporter, HealPoint, Teleporter.
- **is_powerStone_present:** Whether or not power stone is present in the cell.

- **belongs_to:** A string indicating whether the troop is yours or opponent's.
  - Two types- you(guardian belongs to you), opponent(guardian belongs to opponent).
- **guardian_name:** Name of the guardian - Drax, Groot, Gamora, Rocket, StarLord
- **codestring:** Feedback code i.e type of feedback(refer below for more details about feedback).
- **messagestring:** message of feedback
- **data:** Contains data related to feedback.
- **int:** A string of integer.
- if guardian_name is starLord then you will get special_vision along neighbours.

When you receive the ping on an 'action' event with this data you need to send a message to the server to the game server with your action_data to the 'action' event within 1 sec of the ping. The action_data should be in the format specified here

You need to send the action information to system in the following format:

```
{
    "action_type": "action_type",
    "guardian": "guardian_name",
    "target": "(x,y)",
    "player_id": "player_id",
    "round_no": "current_round_no"
}
```

Example can be found here.
The Action Format has the following attributes:
action_type : 'ATTACK' / 'MOVE' / 'SPECIAL'
guardian : 'Gamora' / 'Drax' / 'Rocket' / 'StarLoad' / 'Groot'
target : a tuple of (x, y) coordinates in string format
player_id : Player Id assigned to you
round_no : You can find the round number in the input data.

The following feedbacks will be provided in certain scenarios. You can see the feedback codes below and when they are generated. Find some sample feedbacks here

- INVALID_ACTION: This feedback is generated when the team tries to perform an invalid action. This includes trying to move to non-neighbouring cells, trying to

move at greater speed, trying to attack outside its vision, trying to perform a special action before the cooldown time, trying to move a dead guardian.

- TIMEOUT: This feedback is generated when the team is not able to perform any action within the time limit.
- ERROR: This feedback is generated when the action input is not in the specified format.
- YOU_HAVE_BEEN_ATTACKED: This feedback is generated when a guardian is being attacked by another guardian. This will return the data which specifies the attacking guardian and victim guardian.
- GUARDIAN_DEAD: This feedback is generated when the guardian is dead. This will return data which specifies the attacking guardian and dead guardian.
- ATTACK_SUCCESS: This feedback is generated when the attack has been successful. This will return data which specifies the attacking guardian and victim guardian.
- INFINITY_STONE_PICKED_UP: This feedback is generated when the power stone is picked up by any guardian.
- GUARDIAN_PICKED_UP_INFINITY_STONE: This feedback is generated when the power is picked up by your guardian.
- INFINITY_STONE_MOVED: This feedback is generated when the power stone is moved by a guardian.
- INFINITY_STONE_DROPPED: This feedback is generated when the guardian carrying the power stone dies and the power stone is dropped at the location.
- GUARDIAN_DEAD_AND_INFINITY_STONE_DROPPED: This feedback is generated when the power stone is dropped by your guardian because it died.
- TELEPORT_SUCCESS: This feedback is generated when your guardian uses a teleporter.
- CLUE: This feedback is generated when your guardian uses a Clue/Beast.
- STAR_LORD_SPECIAL_POWER: This feedback is generated in every round and gives you all the coordinates that your guardian(Star Lord) can see in all the four directions.
- HEALPOINT_USED: This feedback is used when one of your guardian's health is restored to 100% by the heal point.

Tournament Fixtures

- Quiz: All Participants need to give a quiz in which you will get questions from our documentation. The tentative date for this quiz is 27th February, 2020 5:00 Pm. 40 Teams will be shortlisted in this round and they are only eligible to participate in the next round.

- Level-1: All the teams will be divided into multiple pools. You will be informed about your pool 24 hours before the tournament begins. Each team within a pool will play against all other teams in the same pool. There will be a leader board (based on the number of wins) for each pool.
- Level-2: Top two teams will be selected from each pool to compete in further levels. Each team will play against a randomly chosen team. The winner moves to the next level whereas the loser gets eliminated.
  *The number of levels will vary depending on the number of participating teams.
- Quarter-finals: Each team will play against a randomly chosen team. The winner moves to the semifinal. The losers compete amongst themselves for 'Fifth' position.
- Semi-finals: Each team will play against a randomly chosen team and the winners will qualify for finals. The losers compete in playoffs.
- Playoff - The two teams losing in semi-finals compete with each other. The winners bag the 'Third' position and the losers bag the 'Fourth' position.
- Finals - The winners of the semi-finals compete with each other. The losers bag the 'Runners-up' title and the winners are crowned the 'Winners' of the GuardAIns tournament.
➔ The Level-1 to Level-2 will be held on 3rd and 4th March, 2022 starting from 2:00 Pm IST.
➔ Quarterfinals to Finals will be held on 5th March, 2022 at 2:00 Pm IST.
  ***The above mentioned dates are tentative and are subject to change.

Judging Criteria

The player who brings the power stone back to their base will win the game. There will be a maximum game time(will be informed later) after which the game will be terminated. In case no player is able to get the power stone back to their base within this specified time then The Score of the Player is will be used to decide the winner of that game which will be calculated as described below.

$$Score\ of\ each\ Guardian\ =\ \sum_{n=1}^{Current\ Round\ No.} \left| \frac{Guardian's\ Health\ in\ n^{th}\ round}{Max\ Guardian's\ Health} \right|$$

$$Score\ of\ Each\ Player\ =\ \frac{Penalty\ Score}{Max\ penalty\ Score} \cdot 0.5 + \frac{\sum_{n=1}^{5} Score\ of\ each\ Guardian}{Current\ Round\ No.\ \cdot 5} \cdot 0.5$$

Each time a team makes any error (will be conveyed later), a penalty will be deducted (will be informed later) from the current penalty score which will be initialized to max penalty score.

The Score of Each Player is calculated and the player with maximum score will be declared as the winner in this case.

**In any other scenarios the decision made by the organizers and/or judges will be final.

Submission Policy

- Participants should submit their code in a zip file format
- The zip file should contain a **run.sh** file which should take the connetion_url, port_no, room_id, player_id, password.
  Example:

```
bash run.sh "http://parsec.iitdh.ac.in/guardains/connect" 8080 "eUn3nHk3d", "gowtham", "mypassword"
```

- Running the script file should set up the required libraries and start the client program.
- Make use of the client code template given [here](#).
- Participants should submit their code before 1st March, 2022 11:59 Pm IST for Level 1.
- All Submissions have to be made through the D2C portal.
- Participants should strictly adhere to the above rules while submitting the code.