

Instructions

1. There is a strict plagiarism policy. In case of the programming portion if any plagiarism is found it would result in zero getting awarded. No copying from classmates or taking code from the internet
 2. The deadlines are strict, submissions made after deadline will be penalised. Please refer to last page for more details
 3. A detailed report including how your game works and the policy design should also be submitted
 4. Try to be as detailed as possible to make us understand your thought process
 5. For Quest1 All the code files alongwith any data should be uploaded in a separate zipfile named: "SoccerRollNo.zip". You can make a common report for Quest1 and Quest2. All these files should be uploaded in a common zip folder named "A1RollNo".
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Let's Play Soccer

AIM: To make students understand the utility theory and bring it to practice by working on Utility functions, policies, single agent game, agent interaction with environment etc.

The task is to model an agent to perform assisted goal shootout in the game of soccer. This is a simple implementation of policies, no learning is expected by the agent.

- There are 2 teams, Chennai FC and Bengaluru FC
- Chennai FC has 3 players and Bengaluru FC has 4 players (1 Kicker and 3 in team Chennai FC play area).
- The players can not move from their respective places once the game starts.
- Bengaluru FC is performing an assisted goal shootout but from the Center Circle position. **(Condition 1)**
- So, one player from the Bengaluru FC team must remain at the center circle to take an assisted goal shoot.
- One player from each team will be staying in the Chennai FC goal box and will not leave it. **(Condition 2)**
- Apart from the center kicker from team BLUE players, the rest of the players will remain in the upper part as shown (Chennai FC Team area). **(Condition 3)**
- Shootouts must be done from the center by the team BLUE player as shown in the below image.
- **How to Play:**

- The assisted goal shoot will be taken by a Bengaluru FC player from the center.
- The kicker is our agent
- The agent needs to decide the shortest goal path, this will be your heuristic cost. (has to be assisted goal) (**Condition 4**)
- With every run, the position of players will be changed, which has to be randomized and should satisfy the previous condition. (**Condition 5**)

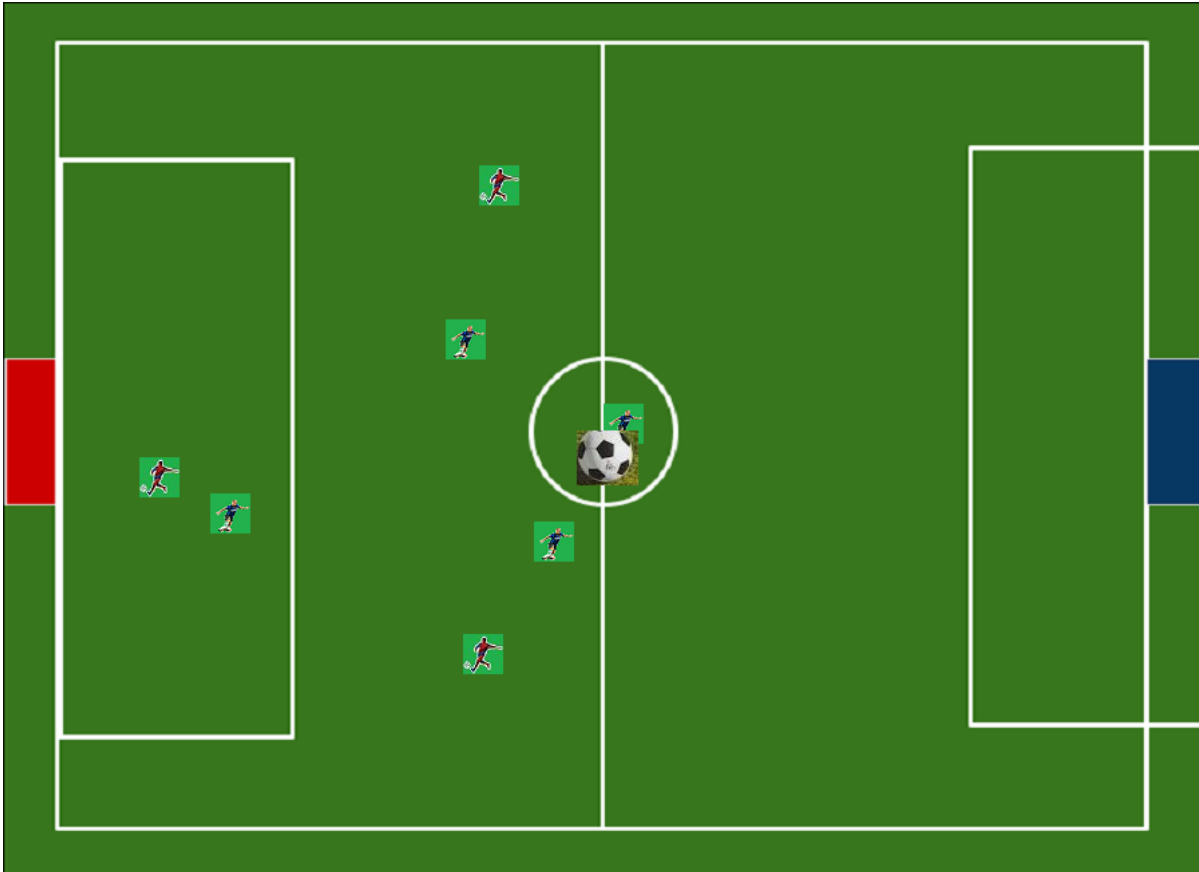


Figure 1: Start of the game

• **Evaluation Componenets:**

- System Design and architecture explanation [**20 Marks**]
 - * You can include block diagrams, algorithms, flowchart, whichever you feel is necessary to understand the approach.
 - * A detailed explanation of each component that is used.
- Implementation of Environment and Agents. [**20 Marks**]
- Conditions followed.[**6*5 = 30 Marks**]
- Printing the cost of the steps (Top 2) for every iteration. (The ways the agent can perform assisted goal. [**10 Marks**]
- Working demo of the game [**20 Marks**]

• **Notes:**

- Designing this game will need using libraries like pygame, turtle . Please find a couple of videos below for your reference.
- https://www.youtube.com/watch?v=5tvER0MT14s&ab_channel=TechWithTim
- https://www.youtube.com/watch?v=vMqobxD0q78&ab_channel=JaideepSinghHeer
- https://www.youtube.com/watch?v=7rRYpX5-9RI&ab_channel=JackhammerDevelopment

Trying our hand at Game theory

Alice , Bob, and Charlie play the following simultaneous game. They are sitting in different rooms facing a keyboard with only one key and each has to decide whether or not to press the key. Alice wins if the number of people who press the key is odd (that is, all three of them or only Alice or only Bob or only Charlie) , Bob wins if exactly two people (he may be one of them) press the key and Charlie wins if nobody presses the key.

- a Represent this situation as a game-frame. Note that we can represent a threeplayer game with a set of tables: Player 1 chooses the row, Player 2 chooses the column and Player 3 chooses the table (that is, we label the rows with Player 1's strategies, the columns with Player 2's strategies and the tables with Player 3's strategies). **(25 marks)**
- b Using the game-frame of part (a) obtain a reduced-form game by adding the information that each player prefers winning to not winning and is indifferent between any two outcomes where he/she does not win. For each player use a utility function with values from the set 0,1. **(25 marks)**
- c Using the game-frame of part (a) obtain a reduced-form game by adding the information that (1) each player prefers winning to not winning, (2) Alice is indifferent between any two outcomes where she does not win, (3) conditional on not winning, Bob prefers if Charlie wins rather than Alice, (4) conditional on not winning, Charlie prefers if Bob wins rather than Alice. For each player use a utility function with values from the set 0,1,2. **(25 marks)**
- d Find the Nash equilibria of the games of (b) and (c). **(25 marks)**

Assessment Rubric for Submitted Work - Evaluation per answer (Viva Analyses):

Proper understanding of question and work done accordingly:	80 - 95%
Attempt to work beyond what has been asked, with in-depth understanding: (Definite contender for full score for question)	95 - 100%
Vague understanding, bursts of in-depth answers:	70 - 80%
Vague understanding, bursts of broad conceptual answers:	50 - 70%
Weird hash of work submitted, some understanding:	40 - 50%
No understanding, just work submitted: (Probable plagiarism)	0

Submission Rubric:

Within 3 days of Deadline:	No penalty
Within 8 days of Deadline:	30% penalty
Within 10 days of Deadline:	50% penalty
After 10 days of Deadline:	Will not be evaluated