TP1 Project Proposal

Project Description:

Title: World Cup Simulator

Description: This term project will be a game that allows users to select their favorite nation and play through a simulation of the FIFA World Cup with them. Each game that the user’s nation plays will be played by the user in real time against an AI (that will vary in difficulty based on the overalls, which are predetermined and hard coded, of the two teams). All other games will be semi-realistically simulated, and the results of those games will be used to determine future opponents (in a true world cup bracket style).

Competitive Analysis:

The style of my term project is in many ways different from others I have seen, generally other projects focus more on the physics engine, while mine intends to focus on the AI side of things, generating an AI opposition (based off of CPUs in games like FIFA or PES). It will not take the approach of some other games (which used web-scraping to generate historically accurate results and predictions) instead, I intend to hardcode rankings (vaguely based off of real-life performances) in order to accurately simulate and represent the included nations. I am in a way basing it off of a real iOS game called Tiki Taka Soccer, which has a very similar art style to the one that I intend to use, as well as similar AI mechanics, that I am intending to blindly replicate at the moment. Overall, the main differentiator of my project will be the unique AI, as well as full control over the team you are playing with.

Structural Plan:

The visuals will be made using sprite sheets for the players, which will be roughly portrayed as classic 16-bit soccer game players. For the field and other large-scale details, I will use CMU 112 Graphics.

I will also have a team class, for every individual nation, as well as a player class, that will make it easier to move players, know who has the ball, and do other integral game mechanics (pass, dribble, shoot).

For the AI, the rudimentary structure will be functions such as slope and adjust, which are currently being used to move players to a certain spot on the field in small increments to simulate travel time, as well as allowing for a more natural and constantly changing game state. I will also create a couple of functions that help the AI decide where to be positioned based on the game state at any given time.

Outside of positioning, I will give the opposition AI a changing reaction time to events in game (which will account for the differences in difficulty), this will make the AI quicker to pass, shoot, or defend in any circumstance.

The game will also have some focus on RNG, where some outcomes will be randomly decided (for example goalkeepers always having a chance of letting a shot in). This will allow the game to have a slight element of unpredictability and benefit risk-takers.

RNG will also play a part in deciding the outcome of simulated games not played by the user. This will allow for occasional upsets (meaning every game is not predetermined).

Algorithmic Plan:

For the AI the following will essentially detail the logic of each player:

GK: Distance from the goal is proportional to the ball’s distance from the goal, meaning that for both GKs as the player moves further away, they will follow away from the goal. As far as their positioning in the Y direction, they will be inline with the ball and the center of the goal at all times

User team: Players off the ball will move as a unit generally at the same pace as the ball, up and down the field, when the team has the ball, they will spread out, and generally try not to clump with the player on the ball by staying a certain minimum distance from the ball. While they do not have the ball, they will maintain their shape and cluster more in the center. Players will make an effort to stay between the ball and the goal, and also between the ball and the nearest opposition player (to cut off the pass).

Opposition team: Same movement for players off the ball, but while on the ball, players will try to move the ball forwards at all times. When under pressure, they will look to pass the ball to the nearest teammate. The strategy for when the AI shoots will be determined based on whether another teammate has a better opportunity to shoot (once the ball has crossed a certain point on the field, they will be eligible to shoot). When defending, the opposition will take on the same strategy as your own teammates, however, the nearest player will close down the player with the ball.

There will be some amount of delay which is variable for all of these decisions to be made. The difference in overall between the teams will decide this delay. Teams with a greater overall will have a smaller reaction time, and vice versa. This will allow for varying difficulty with the AI.

Timeline:

4/17/22: Basic physics of the game (passing, dribbling, shooting) done

4/19/22: Simple skeleton for the AI system done

4/23/22: Opposition AI at a satisfactory level

4/25/22: Final upgrades to the user AI

4/26/22: RNG system and other screens for world cup

Remaining time: Graphic details and visuals as far as possible.

Graphical user interface, application, Word

Description automatically generated

Google docs after every major update to the code

Module List:

None

TP2 Updates:

Method for making AI better or worse works as follows:

-A random number is used to generate a percent chance (this percentage is higher when the overall of the team is higher)

-This percentage represents the chance of the AI acting (moving, passing, shooting, etc.) on any given timer fired.

-This does not affect the decisions necessarily, instead it just allows us to make an unpredictably imperfect AI

-AI will also move as a block in most cases, the ideal AI would be perfectly in formation at all times but this delay will prevent that from happening to keep the game natural

-When a player gets too close to an opposition, the opposition AI will ‘chase’ the player instead of staying in formation, adding pressure

Shooting:

The idea for shooting now works as follows:

-The player will have to time their shot (an animation will play above the users head and the shoot key will have to be tapped a second time, which will decide how good the shot is)

-The placement of the shot will be chosen at random (this is because of limitations with the direction the user is facing) and there will be another randomly chosen offset from the ideal position.

-This offset will be chosen based off of a combination of the timing of the shot as well as the distance from the goal

TP3 Updates:  
-Updated the attacking side of the AI

-AI can now effectively pass the ball and move towards the goal

-AI now know to shoot when they have reached a certain distance from goal and are able to shoot with realistic accuracy

-AI is now affected by overall rating of team

-Both defensively and attacking, the AI will be slower to react if their overall rating is lower. This generally means that there will be more time for the user to move with the ball and also make it easier to take the ball back from worse rated teams.

-Added out of bounds checks and reactions to when the ball goes out of bounds

-Goal kicks now function in game as well as throw-ins

-After half time there is a kickoff and reset of players and the ball

-More teams added and minor graphics adjustments