3V3 SOCCER GAME USING AI

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PROJECT GOAL

Investigate how different tactical algorithms can lead to better performance of the agent and win games

TABLE OF CONTENTS

01

ABOUT THE PROJECT

3V3 Game Analysis of AI using different strategies

02

REFERENCES OF OTHER RESEARCHES

Understanding other researchers and their findings to use it in our project.

03

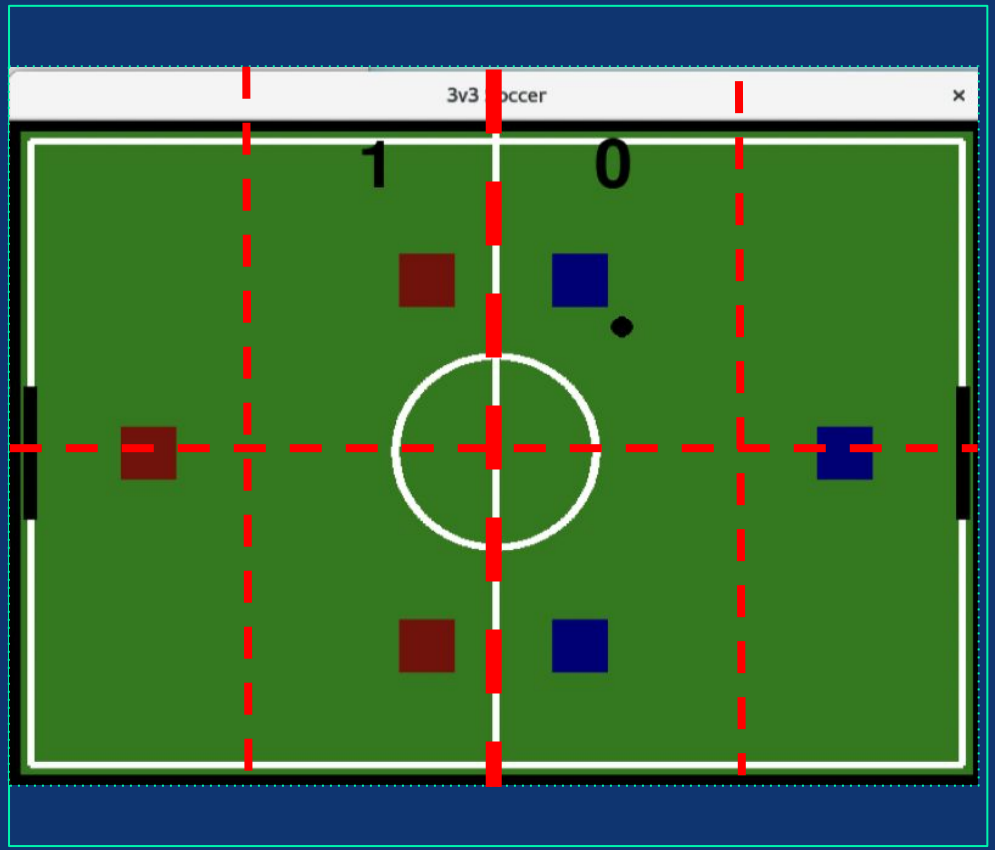
PROJECT GOALS

Being able to analyze the performance of AI

TABLE OF CONTENTS

ABOUT THE PROJECT

Soccer is the most popular sport in the world, we wanted to analyze the different tactical algorithms and how the AI responds to them.



BACKGROUND

RULES OF SOCCER

Adaptation of Soccer rules

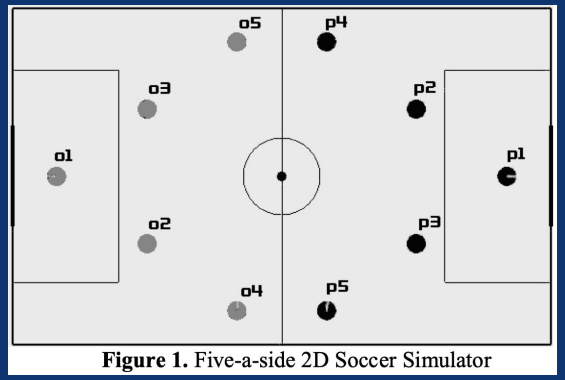
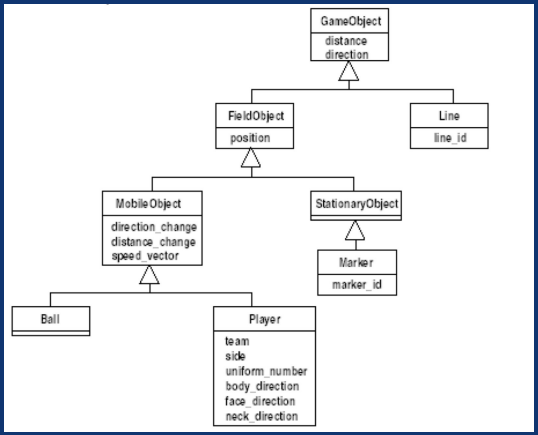


Figure 1. Five-a-side 2D Soccer Simulator

Mozgovoy, M. and Umarov, I., 2011. *Believable Team Behavior: Towards Behavior Capture AI for the Game of Soccer.*

PYTHON AND PYGAME

Python and pygame library



Moemeng, P., 2004. *Issues in Soccer Simulation Software Development.*

AWARENESS OF ENVIRONMENT

Based on the environment check the optimal solution

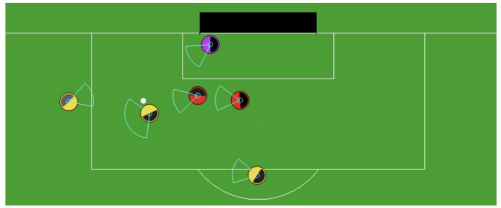


Figure 1: 3v3 Half Field Offense: Yellow offense agents search for an opening in the defensive formation. Red defenders and purple keeper strive to intercept the ball or force it out of bounds. HFO is better understood by video than picture: 1v1 `https://vid.me/sNev`**, 2v2** `https://vid.me/JQTw`**, 3v3** `https://vid.me/1b5D`

Stone, M., Stone, P., Mupparaju, P., subramanian, S. and Kalyanakrishnan, S., 2016. *Half Field Offense: An Environment for Multiagent Learning and Ad Hoc Teamwork.*

PROJECT GOALS

AGENT ABLE TO DETERMINE THE BEST OUTCOME

Investigate the behaviour of the AI agent using different strategies.

THE OPTIMAL STRATEGY TO SCORE GOALS

Determine after experimentation which strategy is the most efficient to score goals.

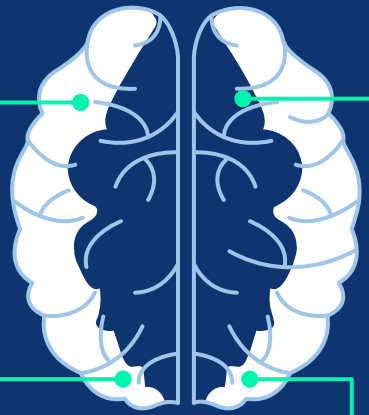
PROJECT STAGES

IMPLEMENTING SOCCER RULES AND ADAPTATION

We were oversimplifying the rules to make a simple game. Yet capable of having AI.

DESIGN OF THE GAME

We used Pygame to render the sprites of the game. First Field, ball and the players.



IMPLEMENTATION OF AI

Decision tree with if else statements to set the rules and design the strategies using the design of the game.

DEBUGGING AND EXPERIMENTATION

A big part of the project was making sure it works with the rules we setted. Long time debugging.

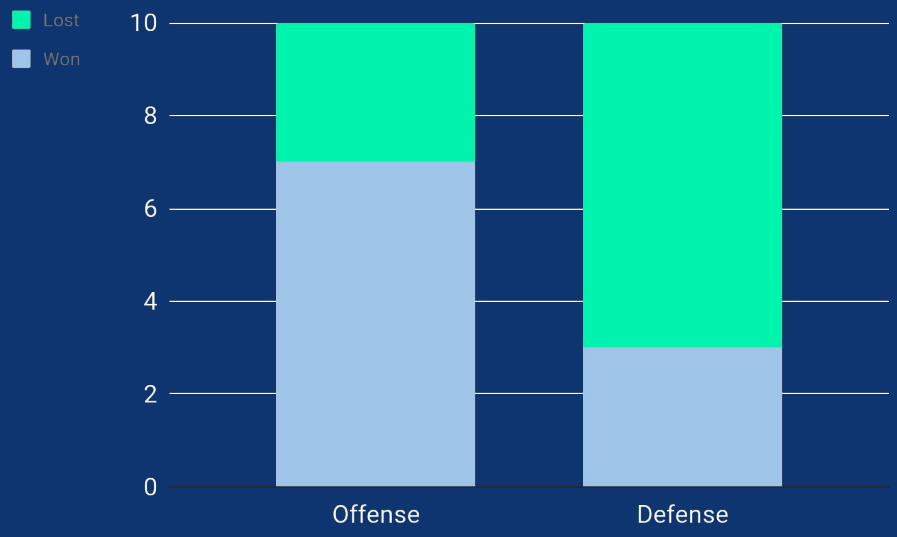
EXPERIMENTATION

TESTS OF THE STRATEGIES

10 Trials, 3 minutes each

Offense: 7 wins, 6.3 Goals per game, more possession in 6 games

Defense: 4 wins, 2.2 Goals per game, more possession in 4 games



DEMO

Here we will see the two different strategies we were able to come up. Offense and Defense

CONCLUSION

The AI agents played better overall with our offensive strategy. It can be argued that agents attacking decisions are more effective than our defensive decisions

FURTHER IMPROVEMENTS

- We would like to make more tests
- Increase the depth of the algorithms to make it more realistic
- Increase the number of algorithms to compare
- Improve the game physics for collisions and shots

REFERENCES

Mozgovoy, M. and Umarov, I., 2011. *Believable Team Behavior: Towards Behavior Capture AI for the Game of Soccer*. [ebook] Available at: <https://mmozgovoy.dev/papers/mu11a.pdf>

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Stone, M., Stone, P., Mupparaju, P., subramanian, S. and Kalyanakrishnan, S., 2016. *Half Field Offense: An Environment for Multiagent Learning and Ad Hoc Teamwork*. [online] University of Texas Available at: <https://www.cs.utexas.edu/users/ai-lab/?hausknecht:aamasws16>