

1.1 Problem Statement

What problem is your project trying to solve? Use non-technical jargon as much as possible.

Our team will create two robots to compete in a soccer inspired competition. They will be controlled by an application that communicates with the Raspberry Pi or Arduino circuit board on the robot. The game will be able to support human vs human, CPU vs CPU, and human vs CPU competition where the robots learn to compete via machine learning.

1.2 Requirements & Constraints

List all requirements for your project . This includes functional requirements (specification), resource requirements, qualitative aesthetics requirements, economic/market requirements, environmental requirements, UI requirements, and any others relevant to your project. When a requirement is also a quantitative constraint, either separate it into a list of constraints, or annotate at the end of requirement as “**(constraint)**”. Other requirements can be a single list or can be broken out into multiple lists based on the category.

Functional Requirements:

- The bots can use machine learning to play the game
- Uses Websocket/handshake protocol over wifi
- Uses camera feed to provide information to the bots
- The bots must be robust enough in case they collide with each other
- The bots will be able to avoid obstacles, and shoot a ball into a goal

Resource Requirements:

- The bots will be using a Raspberry Pi or an Arduino as its brain.
- Two power supplies, one for the motors and the other for the pi.

Qualitative Aesthetics Requirements:

- Bots can travel at a minimum speed of 5mph.
- Bots will have a 1ft turn radius.
- Bots will be able to detect an object within five seconds of it coming into their field of view.

Economic/Market Requirements:

- Cost: \$500-\$600 budget for project
- Bots look aesthetically pleasing and light enough to carry around

Environmental Requirements:

- N/A

UI Requirements:

- The user interface will be easy to navigate
- The interface will have profile information and keep track of stats in the game
- Have a desktop application to control and interact with the robots which will likely be distributed to users via WebAssembly.
- Application will display video feed from the bot being controlled in real time.

Other Requirements:

- Database for storing profile information of users

1.3 Engineering Standards

What Engineering standards are likely to apply to your project? Some standards might be built into your requirements (Use 802.11 ac wifi standard) and many others might fall out of design. For each standard listed, also provide a brief justification.

7007-2021 Ontological Standard for Ethically Driven Robotics and Automation Systems: Our bots will have both an autonomous feature and a user driven code. This code needs to follow the guidelines of being able to provide clear and precise communication between the bots' different systems and/or the user.

802.11 wifi standard: Our bots will be communicating over a wifi signal.

1.4 Intended Users and Uses

Who benefits from the results of your project? Who cares that it exists? How will they use it? Enumerating as many "use cases" as possible also helps you make sure that your requirements are complete (each use case may give rise to its own set of requirements).

We benefit in learning different skills and new languages along the way for this project as something we can take to employers. Also, benefits others in the robotics fields to provide an example of what could be taught to future students. As well as, people who enjoy playing with RC cars or robots and want a fun little game to play.