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## Mechatronic Football - Vision

### **1 Introduction**

Mechatronic Football involves programming and designing robots to play a game of Football. The project has evolved over several years and now involves robots that can actually throw a football via a modified catapult and catch the football via a basket. The Vision project would add a camera system in order to track the robots and help the robots accurately throw the football to other robots.

### **2 Problem Description**

The problem with Mechatronic Football is that throwing a football from robot to robot is extremely inaccurate and adds to a greater level of difficulty for the users to accomplish their goals, which is to score a touchdown. The current system is unable to accurately measure distance and needs a better system in order to measure distance between players in order to accurately deliver a ball.

### **3 Proposed Solution**

Create a camera-controlled system that is able to accurately measure distance between robot players (offense and defense) and relay this information back to the robots and users in order to make a decision. This camera-controlled system would ideally be placed above the playing field in order to view all the players and not interfere with play.

### **4 Demonstrated Features**

**-Real Time Accurate Information Relay:** The camera has to work during real time and experience no lag in order to provide the most accurate and recent position of robots. If there is no real time then the distance between players will be incorrect and the thrown football will not arrive at its desired destination.

**-Player Differentiation:** The camera system would have to differentiate between opposing teams. This could be done through color identification or some signals sent to the camera system from the robots.

**-Simplified Controls/ User Interface:** The greatest benefit from the camera system is that the distance information would simplify controls and information for the user. Instead of relying on inaccurate signals for distance measuring, the camera would allow the robot distance to be measured accurately and would allow the user to choose a receiver to throw the ball the distance measured.

**-Future Distance Algorithm:** The biggest challenge that the camera control system will have to overcome is that the robots will be in constant motion. It is useless to use a distance that was measured 1s ago because that robot already moved. So the camera control system would have to account for the change in motion and possibly predict future position based on movement of the robot from the user.

**-Communication:** The camera system can communicate with robots and users via several signal interfaces such as Wi-Fi, AM, BlueTooth, GPS

**--Durable, Reliable, Easy to Use:** The camera system has to be durable, reliable, and easy to use for future years.

**\*Possible feature- Camera Movement:** The camera has to be suspended above the playing field but it could possibly move around to get a closer view of the robots and move higher to get a bigger view of the field and all the robots. The model can be designed similar to the Sky Cam in a football stadium.

## **5 Available Technologies**

- Cameras and Camera Imaging
- Wi-Fi, AM, Bluetooth, Infrared, Golf Range Finders, GPS
- Robot Control Systems
- Programming Software
- Triangulation

## **6 Engineering Content**

- Electrical Engineering, Computer Engineering/Science, Mechanical Engineering
- Control Systems, Signals & Systems, Computer Programming, Logic Design, Image Identification (Random Phenomena)

## **7 Conclusion**

\_\_\_\_\_The primary goal of this project is to provide the users (mechanical engineers) with fast, accurate information about the position, identity, and direction of the robots. We can possibly explore making an autonomous control of the robots, but that remains to be seen. Our focus will start with determining how to best locate the robots while on the field, compile all the positions into one display, and relay this product to the users. Due to the fast pace of the game, we must achieve these objectives in a very timely manner, constantly updating. First we must investigate the best avenues to gather the information (GPS, IR, camera imaging) and then how to convey it (wired, Wi-Fi, Bluetooth). After this, implementing the system itself will be the main challenge.