**3GIGAHZ**

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**Junior soccer light weight**

Abstract: this poster is explaining a short summary about the hardware and software of our robot. you are going to read about the critical component such as our regulator(lm2576), driver(l6203), microcontroller(teensy3.6), IR sensors(irm8601S), laser(VL53l0x) and etc.we also explain about how we are avoiding out of bound , how we are following the ball and how the robot is detecting the goal. The mechanic of the robot has been stated too.

**Fast and furious, Teensy 3.6:**

At first, we used Atmega16 and code vision as platform. But it wasn’t useful for our new design and processing. So we started an investigation for choosing a modern processor and amaong a large verities of choices, we choose teensy3.6 because of its fast processing (240MHz),enough analog pins, high speed port(480 Mbit/sec) and etc. It also provides 4 i2c ports witch is suitable for our plan. We use the C language in Arduino platform which is easier to use and more famous.

**Using 12, 5, and 3.3 voltage at the same time:**

Based on voltage level we have three types of components: the first group are those who work with 12 volts like our motors and shooting system. The second group contains components which work with 5 volt such as Cmp03, pixy2, SRF02, Laser, and also our photocell. And the last category includes teensy3.6 and our Bluetooth HC-05 which need 3.3 volts to work.

So we need several components to decrees the voltage level. Namely LM2576 and AMS. We use LM2576 to lessen voltage level from 12 to 5 volts and AMS is used to transform 5 to 3.3 volts. This components can provide all the active functions for a buck switching regulator and also it’s capable of driving 3-A load with excellent line and load regulation.

**Driving the motors, L6203:**

Teensy doesn’t supply motor’s current so we use L6203 to amplify the current. Drivers also helps us to determine the direction and the speed of the motors.

**VL53l0x:**

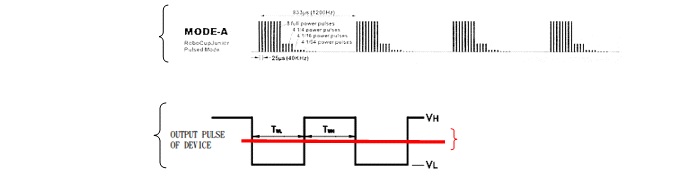
We used VL53l0x to get the distance of the robot from its behind wall. This module sends cone-shaped laser to the wall and calculates the distance by using the time of this process. For this usage we had other options like SRF02 and Sharp but this module has more frequency and cleaner data.

For goalkeeper algorithm we use this component to go to and stay in a certain distance from the goal.

**The ball detection:**

Detecting the ball would be done by using IR sensors namely irm8601S with 40 kHz filter. We have 16 Sensors that are located in22.5 degree from each other and are used to detect the angle of the ball from robot and 4 Sensors in 90 degree from each other to detect the distance of the ball from the robot.

The ball sends IR pulse like the below picture and our sensors receives the pulse after that the data goes a RC filter which is an integral circuit containing a resistor and a capacitor connecting as a series circuit to converts it to voltage.



Sensor’s output in teensy 3.6 is an ADC number. According to distance changes from ball to sensors, the output would change. With compering the data from the 16 available sensors, we understand the location of the ball.

**Avoiding out of bound:**

For detecting the white line, we used photocell (LDR) that is a light controlled variable resistor. The resistance would decrease with increasing light intensity. // therefore, if the ground’s color is white it caused more reflection and decrease resistor and if the color of the ground were green, there would be less reflected light and more resistor.

19 LDR and 2 LED for each one of them are located in shape of “plus” and are grouped in two kind on every side of the robot: inner and outer sensors. We used this design to prevent missing the white line and getting back to the game if the robot gets pushed of the field. The LDRs are parallel so they have different resistors. Therefore, we need voltage division circuit for sending data to Teensy. The voltage output in teensy can be a number between 0 and 1023.

As we said, sensors are grouped in two parts: inner and outer. When the outer sensor detects outline, the robot stand beside the outline but there is a chance that robot crosses the line because of high speed this is why we have the inner sensors to detect the line farther partly crossing it and moving in the opposite direction till the outer ones see the line .

While the robot is located beside the outline and the ball is out, it would wait there. However, if the ball is in, it would go back to the field and continue the game.

**Pixy2:**

One of the factors that makes our robot performance better than the other robots is that we’re always facing the opponent’s goal so we always have precise attacks and all of it is thanks to our Pixy2.

Pixy2 is a module that not only its light weight (10 grams) but also it has many great features for example it can work with all of the following out puts:  UART serial, SPI, I2C, USB, digital, and analog; it also has very suitable field of view (60 degrees horizontal, 40 degrees vertical) and one of the important points that you can’t pass is the Pixy’s high framerate which is 60 frames-per-second.

**Handel and Bottom:**

We made our handle by bending Polypropylene rod which is a flexible material that would protect our robot against strike and prevent entering to the goal.

We also used aluminum plate which despite of its light weight it is more stable and fortified against the strikes.