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RoboCup  
Eindhoven 2024

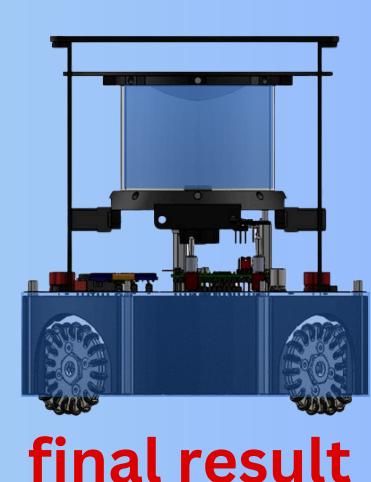
A.T.R.T



## PRODUCTION

### Construction

For the construction design we had many ideas and discussion about it and most important discussion we had was about adding a Cylinder between camera and mirror and also a surface around first floor of the robot for protection and making the robot to look better and this idea was approved during the discussion about it.

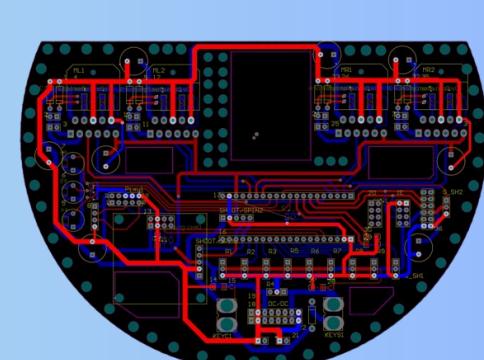


final result

### Design

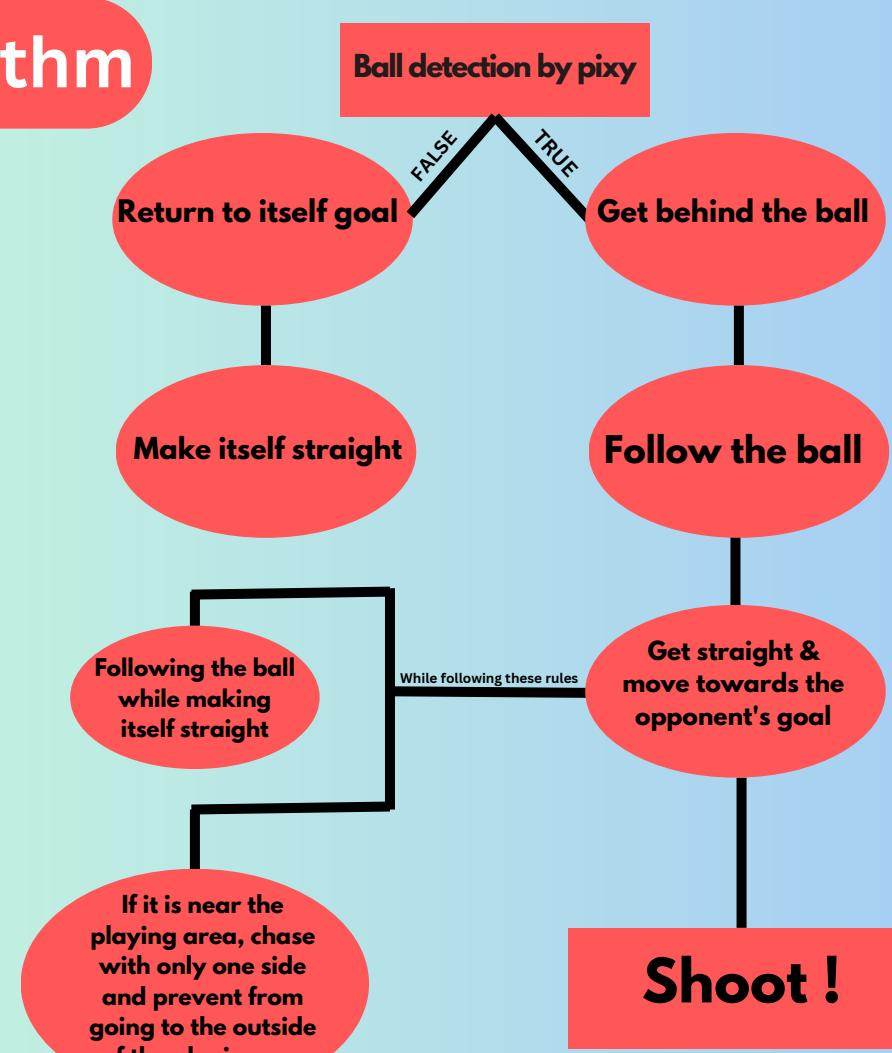
#### Altium Designer

for sketching the electronic board of robot we have used Altium designer application and we designed the board with the format of PCB then we printed the physical board



## SOFTWARE

### Main Algorithm



### Applications



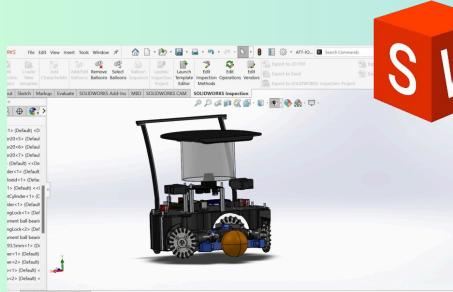
#### Arduino Uno:

For the programming part we have used Arduino IDE that is very famous and within all choices we had this one was more suitable for our team.



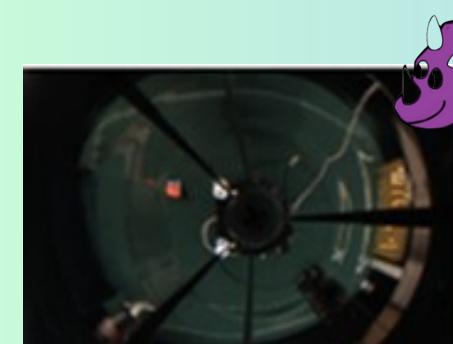
#### Altium Designer:

For designing the PCB of electronic board we have used Altium designer app because it has lots of options in order to use for a better design and more quality.



#### Solid Works:

In order to design the robot mechanic part Solid Works helped us to do that its the most popular app for mechanic and engineering design, after designing all mechanical parts we printed the parts with 3D printer.



#### PixyMon:

For using pixy camera its necessary to use this application to set the color of the ball for the camera, this app its easy to use and also easy to learn.

## RCJ Open League - Netherlands, Eindhoven

## ABSTRACT

We are four students from Alameh Tabatabae school in iran, all four of us were interested in robotics, so we decided to participate in iranOpen competition with the goal of participating in RoboCup Junior Soccer but we had to practice and build the robot, we started our robotics activities for practicing and building the robot during school and after finally practicing the indeed amount and building the robot we participated in iranOpen competition and achieved 1th place, and because of that we became capable of participating in "RoboCup Junior Soccer" during the robotics activities that we had we have learned a lot, gained lots of knowlge and experience.

we are glad, excited and proud to be a part of "RoboCup Junior Soccer" not only because of the competition itself but to meet other people with the same interests. this poster contains important information's about such as Software, Hardware of the robot and the progress of our activities.

## HARDWARE

### 1 Mirror



We have used an Spherical mirror therefore we can have 360° degrees view via camera of the field of the game.

### 2 Omni wheels



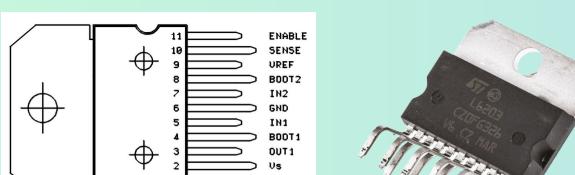
For Wheels we have used omni wheels because its capable of moving in two direction and it moves in a soft way and that is very important for movement of robot.

### 3 Engines



Motors that we have used are from maxon company in Swiss and they are powerfull it has 630 RPM and strong torque.

### 4 Driver

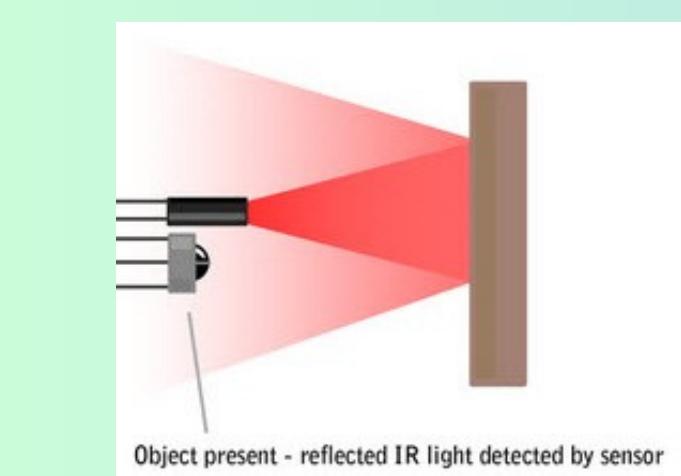


In order to have a better and smooth movement we have used this driver, the model is L6203, its full-bridge and it helps with the speed and power and stability of the voltage.

### 5 Sharp



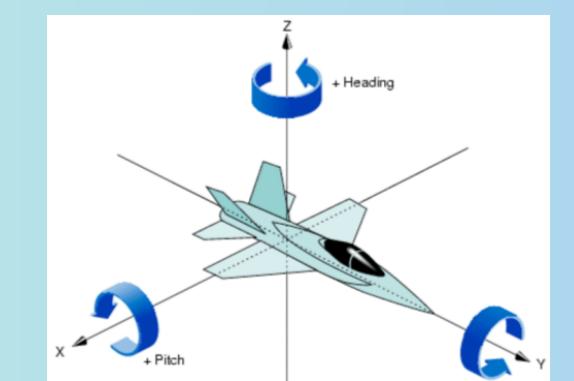
This sensor is a type IR that can calculate the amount of distance from 20 up to 150 cm, by using this sensor we wrote especial algorithm.



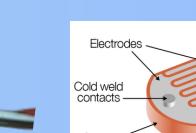
### 6 Gyroscope (Gy-25)



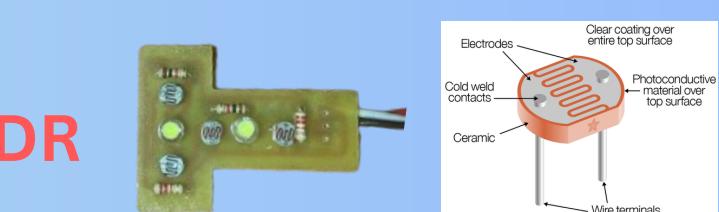
Its fundamental for the robot to center itself and also be stable, in this case we needed a sensor for that and we chose Gy-25 model MPU-6050, this module contains 3 axis(pitch, roll, heading) and kalman filter that helps with the accuracy and makes this sensor work better, Gy-25 has Serial connection(RX, TX) and I2C to connect with the microcontroller.



### 7 Shoot

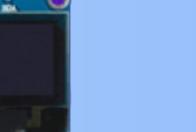


### 10 LDR



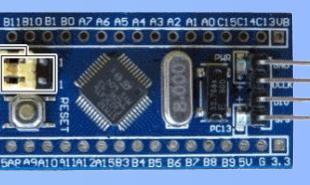
For the algorithm of preventing going out of out we have this sensor that contains fotosel and an white LED, the way it works is that the amount of number that it shows its different on each color so while its on the white line(out) the amount is different with these informations we wrote the algorithm related to it.

### 9 OLED

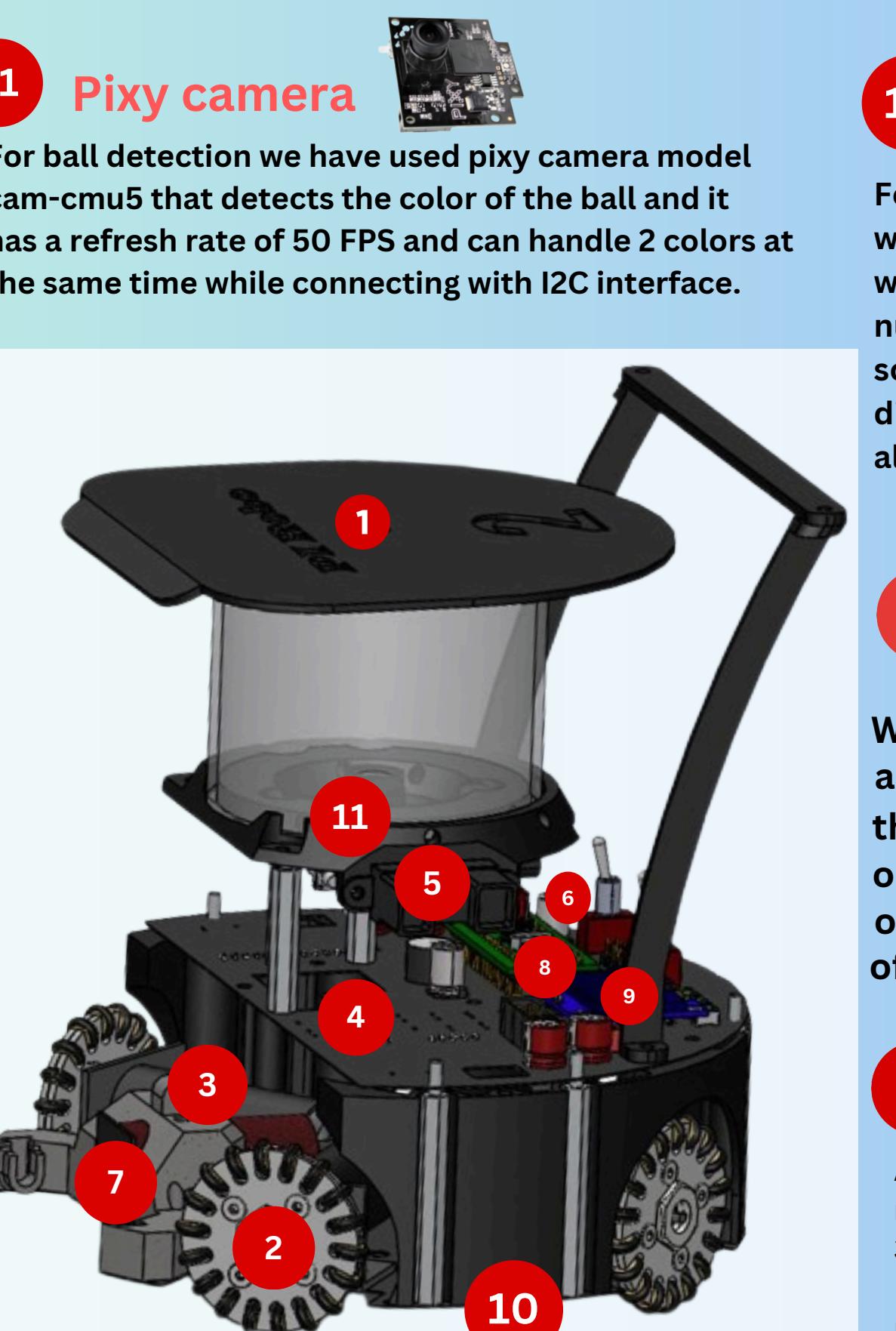


We have OLED as a displayer for main sensors amount for writing code and also making sure that the sensors are working during or before or after the game this displayer helped us with our calculations for angle of ball and distance of the ball.

### 8 Stm32F103



As main processor we have used stm32 microcontroller from ARM micros, it has 32 bits and its capable of transferring infos very fast and accurate. this micro its also very popular and mostly used in robots. we have used ATmega micro before but the speed and accuracy was low.



## Past Awards

2024 1th place iranOpen(Junior Open league)

## Contact

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## METHODS

### Angle of Ball

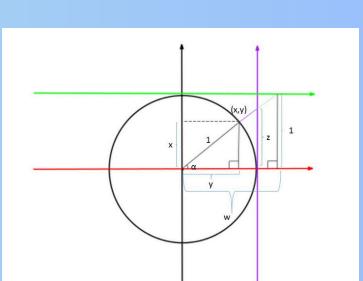
According to the usage of PIXY camera we have access to the location of the ball ,by using Trigonometric relationships we could calculate the angle relative to the robot and this idea worked very well and we decided to use this calculation for our main algorithm.

#### Programming Formula

$$\text{atan2}(y - y_{\text{Robot}}, x - x_{\text{Robot}}) * 180 / \pi;$$

#### Mathematical Formula

$$\tan^{-1}((y_b - y_R) / (x_b - x_R))$$



### Distance of Ball

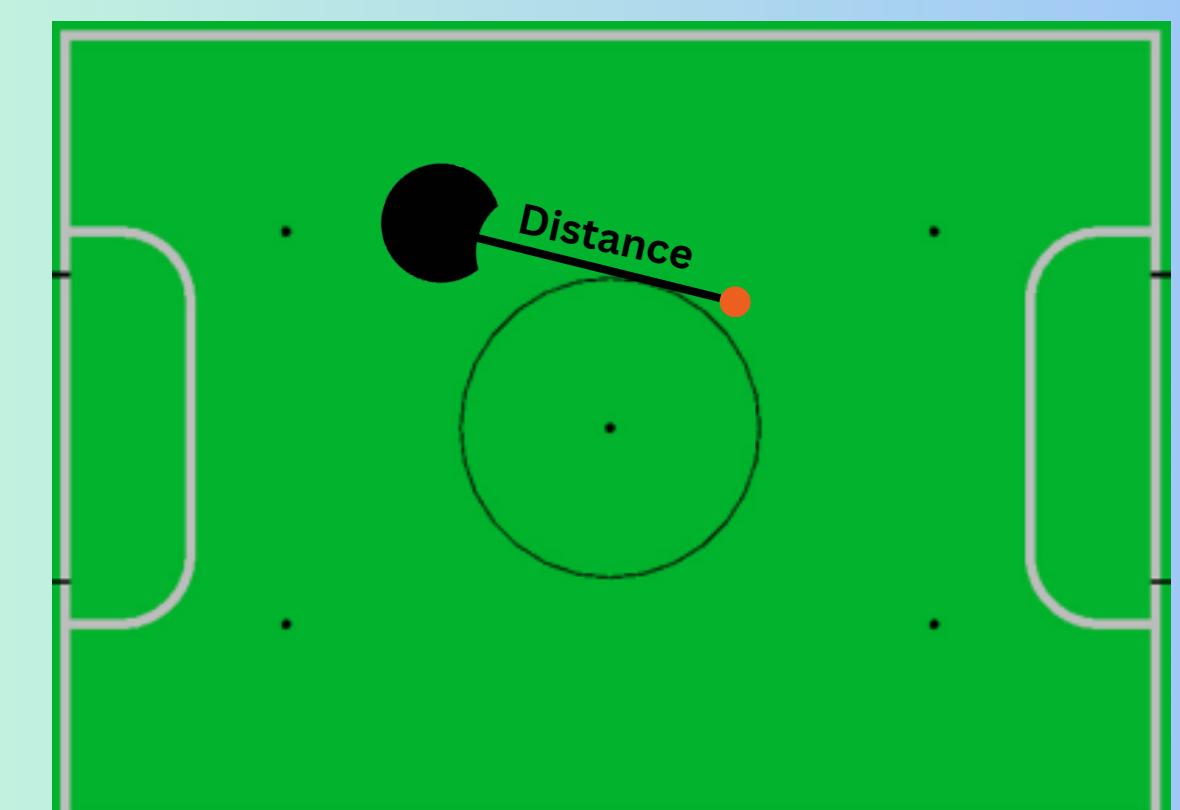
After locating the ball and using Pythagorean theorem, distance of the ball from the robot will be obtained and by having the amount of distance of the ball from the robot we can locate the ball even better and write interesting algorithms.

#### Programming Formula

$$\sqrt{\text{pow}(x_{\text{Ball}} - x_{\text{Robot}}, 2) + \text{pow}(y_{\text{Ball}} - y_{\text{Robot}}, 2)};$$

#### Mathematical Formula

$$\sqrt{(x_b - x_R)^2 + (y_b - y_R)^2}$$



### Shifting

For positioning the robot mouth in front of the ball we have wrote an algorithm that robot shifts itsel position.

