

OCAMM-SOCCER



ABSTRACT

We have designed a defense machine and an offense machine. The difference between them is that the defense machine has a camera, while the offense machine has a dribbling device. We also wrote a defense program and an offense program, respectively. We developed the programs over 6 months, during which we incorporated new designs (e.g., camera, dribbling device, kicker). We created our own omni wheel and grayscale board to achieve smoother results. Additionally, we redesigned the entire structure and upgraded the materials.

ABOUT US



WONG PAK HANG
Mechanical Design Captain



PUN CHON LAM IVAN
Software

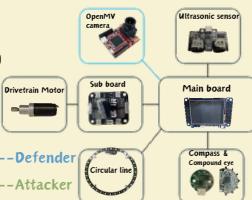


CHEONG IOK CHI
Hardware



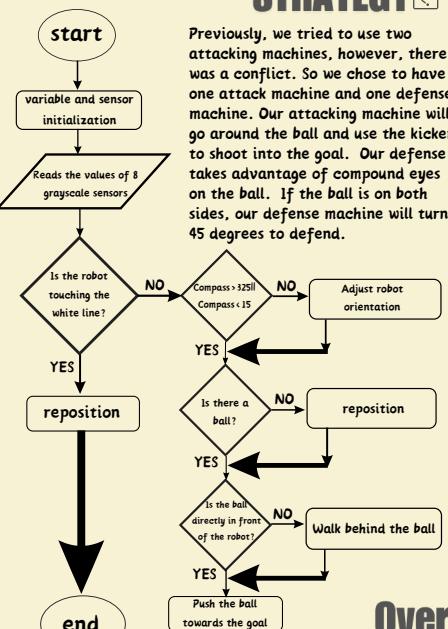
YE CHON KIT
Software

System Overview



STRATEGY

Previously, we tried to use two attacking machines, however, there was a conflict. So we chose to have one attack machine and one defense machine. Our attacking machine will go around the ball and use the kicker to shoot into the goal. Our defense takes advantage of compound eyes on the ball. If the ball is on both sides, our defense machine will turn 45 degrees to defend.



DEVELOPMENT



CNC Cutting Machine
(Carbon Fiber)



3D printer
(Polylactic Acid)

Overall Process APPLICATION

Drawing
CNC cutting or 3D printing
Programming
Repeat



OpenMV



SOLIDWORKS



C++

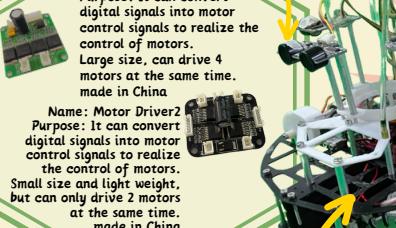
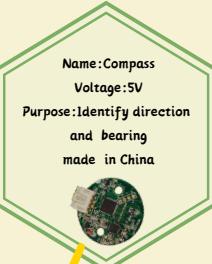


CorelDRAW

ATTACKER

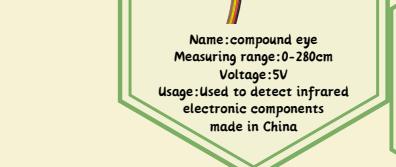
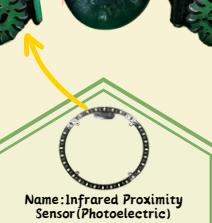


Name: Ultrasonic sensor
Voltage: 5V
Measuring range: 1cm-140cm
Purpose: Measure the distance between yourself and the object to be measured.
made in China



Name: Motor Driver1
Purpose: It can convert digital signals into motor control signals to realize the control of motors.
Large size, can drive 4 motors at the same time.
made in China

Name: Motor Driver2
Purpose: It can convert digital signals into motor control signals to realize the control of motors.
Small size and light weight, but can only drive 2 motors at the same time.
made in China



Name: compound eye
Measuring range: 0-280cm
Voltage: 5V
Usage: Used to detect infrared electronic components made in China

Name: Infrared Proximity Sensor (Photoelectric)
Voltage: 5V
Purpose: Convert the intensity of light into a digital signal to identify whether there is out of boundaries
This is our homemade



DEFENDER



Name: OpenMV Cam
Voltage: 5V
OpenMV Cam H7 uses the OV7725 camera module to support 60FPS 640x480 8-bit grayscale images or 16-bit RGB565 images, up to 120FPS 320x240 image capture.
combined use with Hyperbolic Mirror



Name: Motor (for kick)
Nominal voltage: DC 12V
No load speed: 1200±8 % rpm
No load current: 600mA
Stall torque: 18Kgf.cm
made in China
Use: Motor for driving kicker(driving kick)

Name: Motor(Wheel)
Purpose: for moving made in China



Name: Omni Wheel
Purpose: Able to move in many different directions
This is our homemade

PROGRAM ↓

Motion Around the Ball

To achieve approximate tangential motion, we establish a functional relationship based on the strength of the ball.

Left: path = fc * f / 110;
Right: path = fc * 90 * f / 110;
--> f: light value intensity(distance)
--> fc: light value angle
--> 110: light value intensity maximum

Using the maximum light value intensity
The logic of the equation primarily uses the light value intensity percentage to determine the size of the tangent line:
the greater the distance, the smaller the tangent line, making it more like a straight line, and vice versa.



Back to Initial Position

Goal: Know where the robots are on the court, and be able to return quickly in certain situations. The data we want to know: the distance between the machine and the target point, and the angle of the target point relative to the machine (angle).

1. The origin and the value determined by the ultrasonic sensor are used as the distance.
2. Establish data plan conversion coordinate system, determining only the abscissa and ordinate of the machine through the obtained information, and organize the program to drive the robot and the target point to the specified coordinates (as shown in figure 2).
3. Use the X and Y data to find the hypotenuse through the Pythagorean theorem and judge the tangent relationship when calling the atan2 function.
4. Use the tangent direction to angle and judge the value of the distance to realize the reset function.



Ultrasonic lock and Partition

We used ultrasonic ranging to accomplish the headlock of the robot at the beginning of the race, so that the robot could keep the direction. We also used ultrasound to divide the field into four zones in order to better determine the robot's approximate position on the field.



SOLUTIONS

1. Modified the structure of the disk. The structure of the gears uses a big gear to turn a small gear, making the disk more powerful.
2. Installed multiple locations, enabling the sensor to achieve a 360-degree infrared range.
3. Use spacers to raise the ultrasound to prevent false detection of the gantry.
4. Changed to using PLC and carbon fiber material.

PROBLEMS ?

1. The speed of the disk is not enough to cause the ball to drop, but the weight is not enough to replace the motor.
2. Only one side of the compound eye is installed, only 180 degrees of infrared can be seen.
3. Ultrasonic diffusion will detect the gantry when it is close to the goal.
4. The acrylic plate is easy to be knocked apart.