MORE INFORMATION

For more information feel free to visit our website, bbcrobotics-mna.com or use the QR code below. Also see our poster or talk to one of us in person for more information, we are more than happy to share our knowledge.

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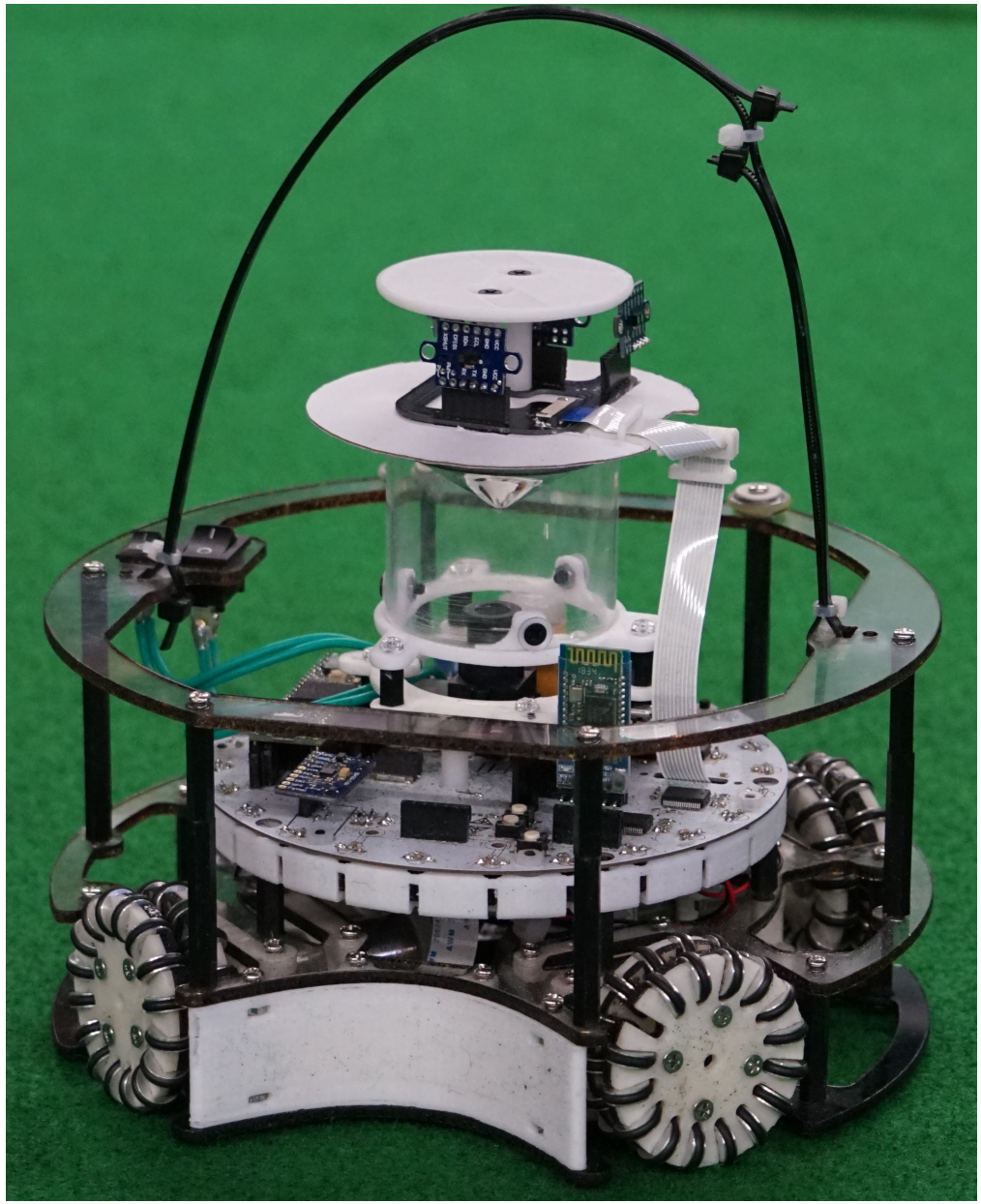
ROBOTICS
BRISBANE BOYS' COLLEGE

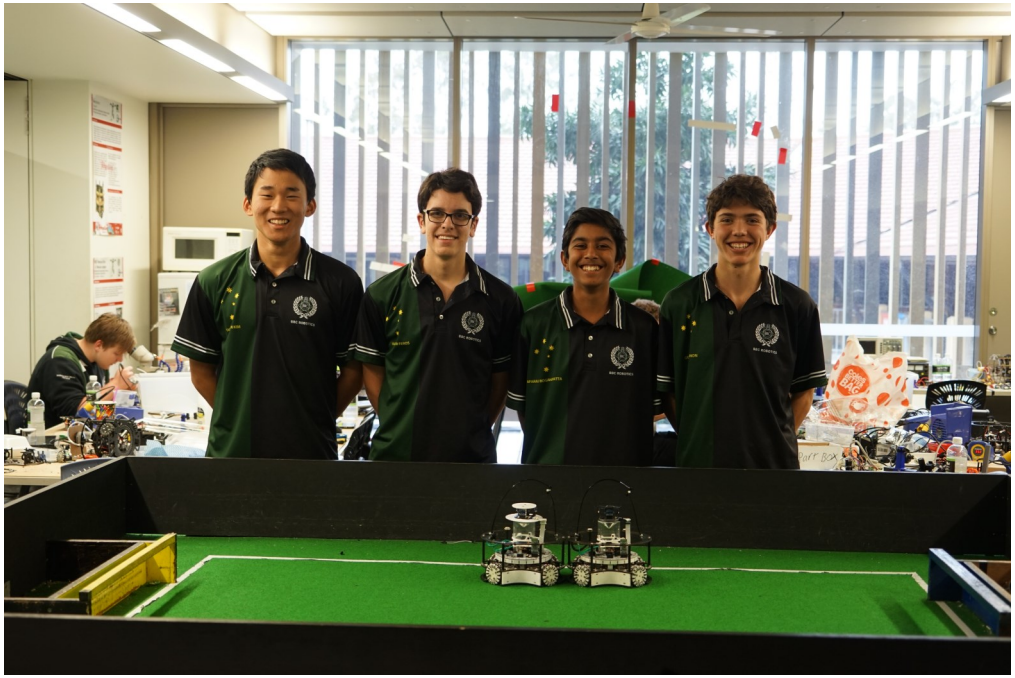
M&A

Brisbane Boys' College, Australia



THE TEAM

M&A is an Australian team from Brisbane Boys' College. Our team of four have made two identical robots to compete. Last year we placed 2nd at the Australian National Competition. The robots have been developed since September 2017 with five different design iterations for different RoboCup Competitions. Our team consists of four members (left to right): Taehwan Kim, Matthew Feros, Aparaj Bogahawatta and Gus Gannon.

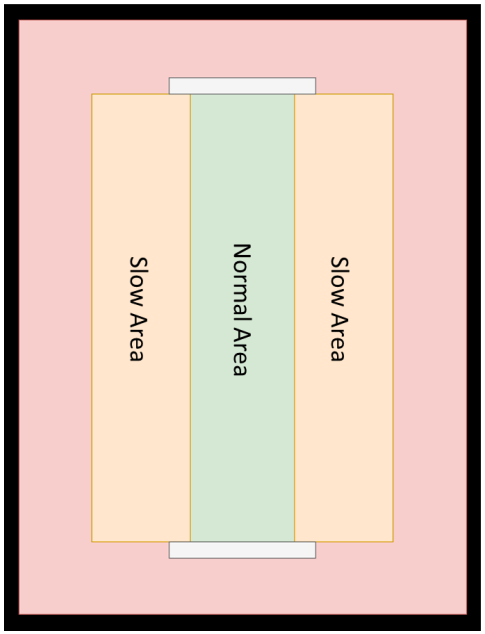


INNOVATIONS

Advanced Line Avoidance

The Laser Range Finders (LRFs) give the robot a distance to the wall with millimetre accuracy. These distances are used to know the robot's position on the field. This means that we can tell if the robot is near the line and pre-emptively slow down before we touch the line. This decreases the amount of times the robot goes out of the field and is called off for damaged. If the robot does go on the line, the light sensors will detect and avoid the line.

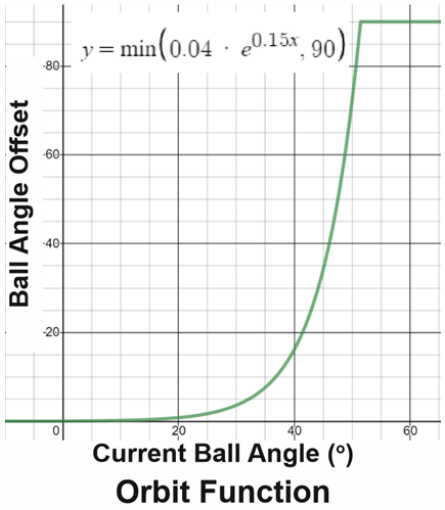
The LRFs will also aid in goal tracking in the Super-team scenario as the large field size makes it harder for the camera to track the goal. This is because the field's size is larger than the camera's view range.



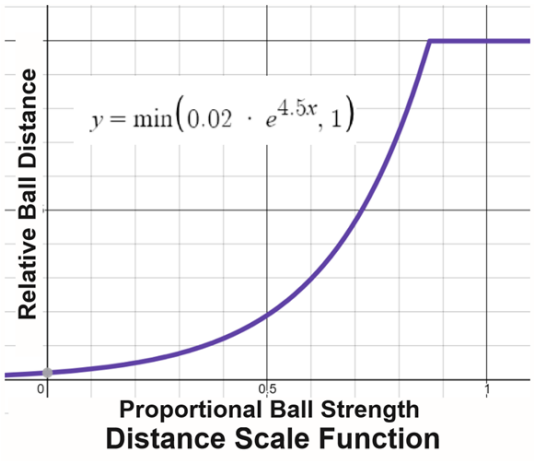
ROBOT SOFTWARE

Ball Following

Each robot has 24 digital IR sensors with an output value of 0 when it detects IR light, or an output value of 1 when it can't detect IR light. We calculate the ball angle and distance by using the top four values and using vector addition. After the direction of the ball is calculated, two mathematical models calculate where the robot should move. The first model determines the angle added to the ball direction, so the robot positions itself behind the ball (orbit function); the second model scales down the angle added based on how far away the ball is (distance scale function).



Orbit Function

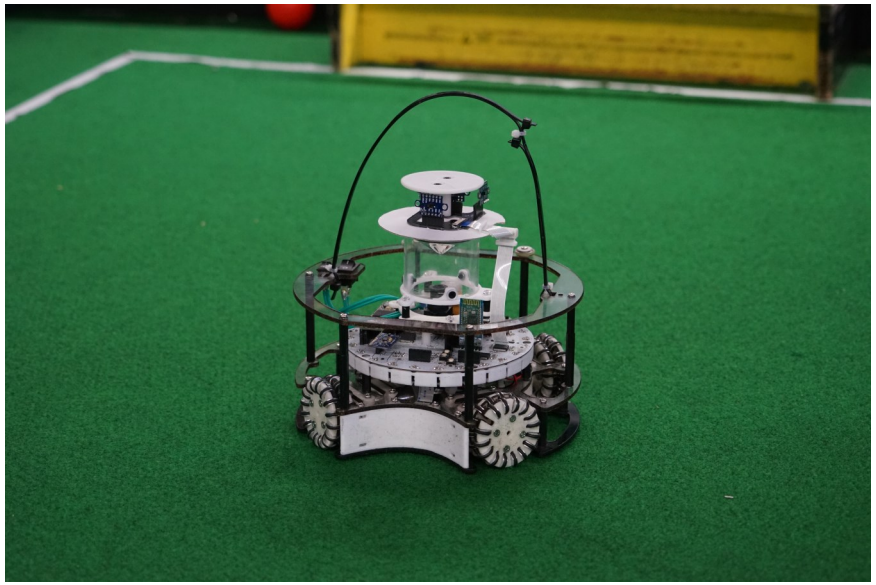


Distance Scale Function

ROBOT HARDWARE

Robot Structure

The robot is comprised of three separate layers which form the frame of the robot. This creates a robot which is easily accessible for both production, maintenance and repairs. The chassis is made up of three custom-made laser cut poly-carbonate plates. The three plates are connected by a combination of lightweight nylon and metal standoffs. These are used in conjunction with 3D printed custom parts to form the structure of our robot. The custom parts were made in the program

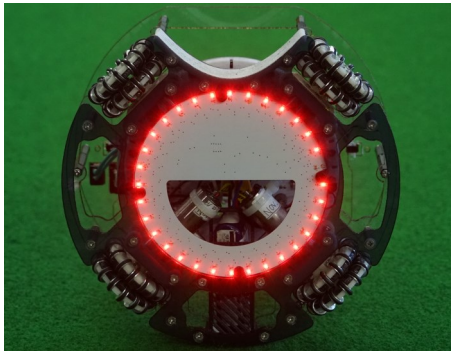


M&A robot

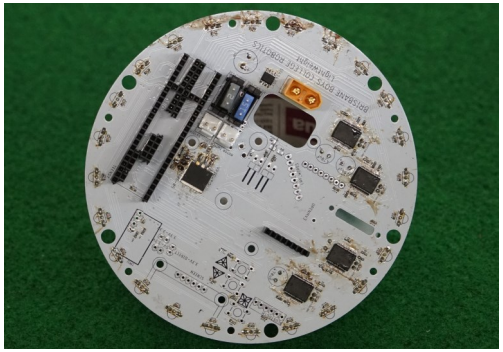
ROBOT HARDWARE

Electronics

The robots' electrical system is a combination of 3 printed circuit boards (PCB's). PCBs were used in this robot to reduce the number of external connections, increasing the reliability of connection to different components. The PCBs are connected to each other by Flat Flex Connectors (FFCs) like ones used in many smartphones and tablets in the Tech-Industry. The PCB on the Bottom Plate (Light Sensor PCB) is used to detect the white line. The PCB on the Middle Plate (Main PCB) holds all the main circuitry and the bulk of the components. It holds the two micro-controllers which calculate the robot's movement.



M&A light sensor PCB

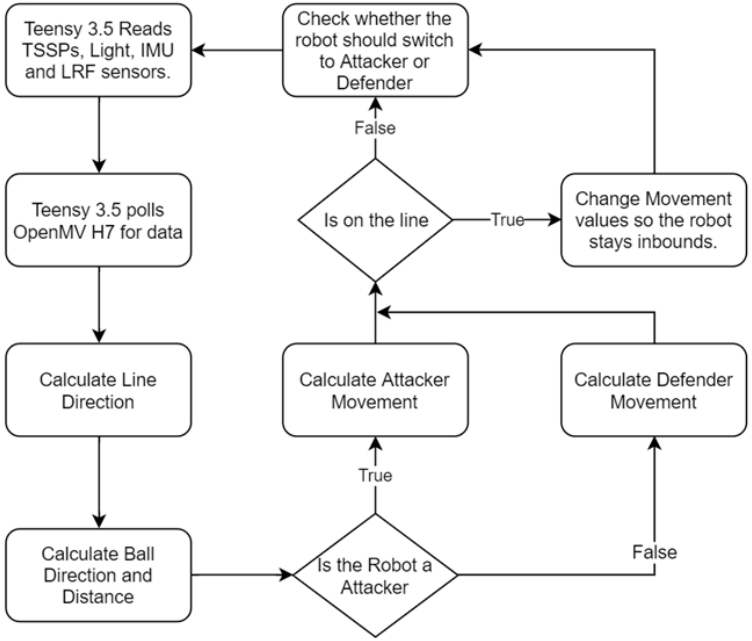


M&A main PCB

ROBOT SOFTWARE

Overall Logic

The robots have been programmed using C++ and Python with two micro-controllers on each robot. The Teensy 3.5 does the bulk of the calculations and receives data from all the sensors. The OpenMV H7 is an optical sensor that calculates the goal direction and distance and sends those values to the Teensy. The Teensy then sends motor values to the motor controllers. The robot follows a set of steps, shown in the Robot Logic Flowchart, to determine where it should move.



Robot Logic