
STAGES TO BE EVA

ENG. JIHAD

NADA

MAHMOUD

ARTAJ

CSMIC

Introduction

Self Driving car

WRO ----- Future Eng --- Self driving car

The **World Robot Olympiad (WRO)** is a global robotics competition for young people. First held in 2004 in Singapore, it now attracts more than 26,000 teams from more than 65 countries.

Problems

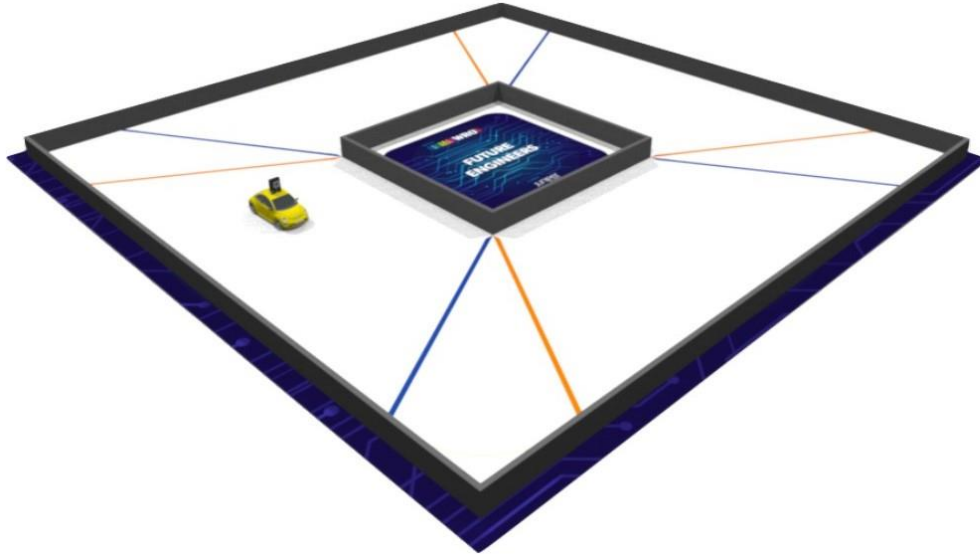
Our Challenge:

Our competition came in the category of **Future Engineers** whose idea is to design a self-driving car capable of overcoming the obstacles and challenges it faces, and all of this falls within the framework of machine learning and artificial intelligence (AI).

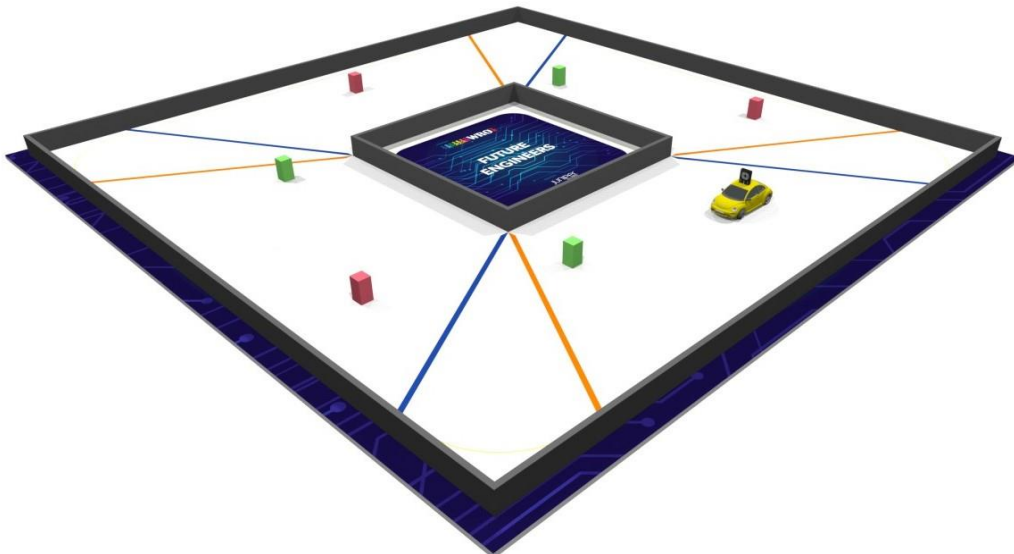
Specific contest idea:

The competition is a circuit with an inner and outer frame consisting of 4 corners. The race consists of two stages. In the first stage, the robot must complete 3 laps within 3 minutes and return to the starting place. In the second stage, there are obstacles, which are red cubes And green, the robot must skip in a specific direction according to its color (red: right) and (green: left), and it must also complete 3 laps within 3 minutes and return to its place.

Stage (1)



Stage (2)



Hypotheses

During our work and manufacture of the robot, there must be problems and obstacles that had to be solved, taking into account the factor of accuracy and time, and solving these problems came within the framework of many trials and errors, and it required us to be patient.

Hypotheses and questions we faced:

- **How can a robot do machine learning using electronics?**
- **How can a robot complete the race with the fewest mistakes?**
- **How can a robot handle all possible cases?**
- **How to employ the appropriate electronics and know their use?**
- **How can a software algorithm be found to solve all situations?**
- **can the robot turn the path and overtake the obstacle under the rules it adheres to?**

Methodology

The Work is divide into three main parts:

- **Electronics**
- **Design**
- **Programing**

First the available electronics requirement is stuedied depending on the WRO specifications

Then, the cases for these electronics part is designed throw 3d printer and then make the first test to make sure it work correctly ,

After that we structure the draft robots by using 3d Application Thinker cad

Our journey started with building an **(EVA)** robot with its first version, then we made modifications and developments in all aspects that support building the robot to make it more efficient, accurate, and faster. For this development and modification, we worked on the **main points:**

- Electronics:

1- Using new controls that are efficient and quick to operate.

2- Development of the electronic system for the robot.

3- Using more efficient sensors that increase accuracy in crossing barriers.

- Programming:
 - 1- Modify the code according to the new electronic parts used.**
 - 2- Develop code algorithm to be faster and more accurate**
- Design:
 - 1- We used a 3D printing machine to create a body and design the robot to be of the appropriate sizes.**
 - 2- Develop the shape of the design to be consistent with the new electronic parts.**
 - 3- Coordination of printed models to match the conditions of the robot's configuration, size, and shape.**

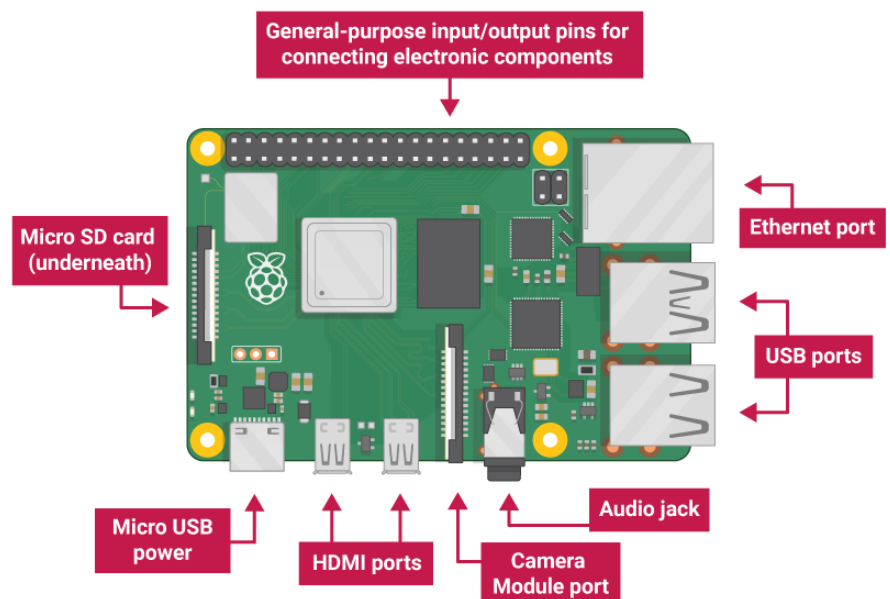
The Electronics

Used Electronics:

- **Raspberry Pi 4 Computer**
- **Arduino Mega 2560**
- **Raspberry Pi Camera**
- **L298N Motor Driver**
- **Ultrasonic Distance sensor x(4)**
- **s3003 servo motor**
- **DC gear motor 12v 60 RPM**
- **Power Supply**
- **Wires**
- **Wheels**

Raspberry Pi 4 Computer:

- **Processor:** Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz.
- **Memory:** 1GB, 2GB or 4GB LPDDR4.
- **Connectivity:** 2.4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac wireless LAN, Gigabit Ethernet
2 × USB 3.0 ports
2 × USB 2.0 ports
- **GPIO:** Standard 40-pin GPIO header.
- **Input power:** 5V DC via USB-C connector (minimum 3A)
5V DC via GPIO header (minimum 3A)
Power over Ethernet (PoE)–enabled.



Uses And Function: (Raspberry Pi 4 Computer)

The **Raspberry Pi 4** was used for image processing and to download OpenCV on it.

And the **Arduino Mega 2560** was programmed through it.

Arduino Mega 2560:

- **Microcontroller:** ATmega2560.
- **INPUT VOLTAGE (LIMIT):** 6-20V
- **Flash Memory:** 256 KB of which 8 KB used by bootloader.
- **Analog In Pin:** 16.
- **Digital I/O Pins:** 54 (of which 15 provide PWM output).
- **Weight:** 37g.

