2017

SUMOROBOT Competition

Mansoura University

Faculty of Engineering

Department of Computer Engineering and Systems

Systems Modeling and simulation CSE 3216

Group 12

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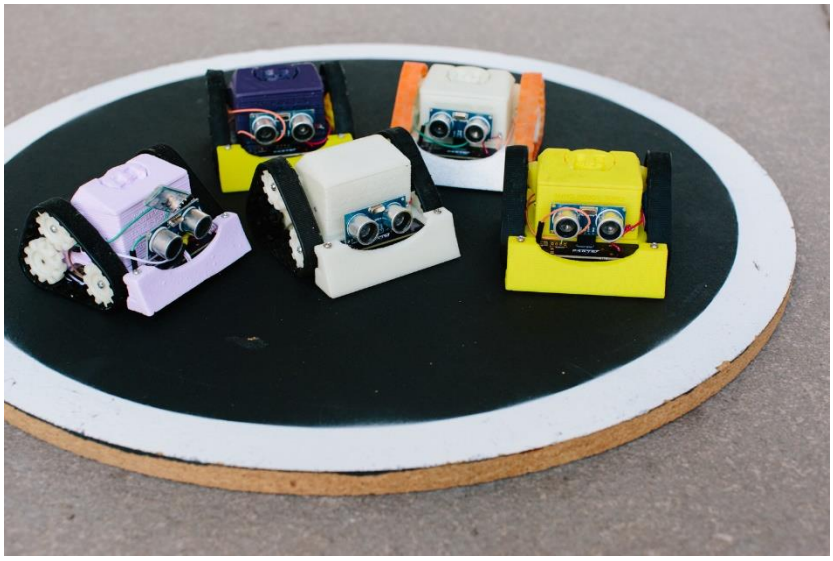
Abstract

This report “SUMOBOT Competition” aims to discuss how the project is made, the tools and components we used, the concept behind making this project. The project is about how to use microcontroller (ARDUINO) and attached sensors to detect other robots and fight them, and stay in the ring automatically.



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1 Introduction

A Sumobot is an autonomous robot programmed to push other Sumobots out of a ring without getting pushed out itself. The engineering challenges are for the robot to find its opponent (usually accomplished with infrared or ultra-sonic sensors) and to push it out of the flat arena. A robot should also avoid leaving the arena, usually by means of a sensor that detects the edge.

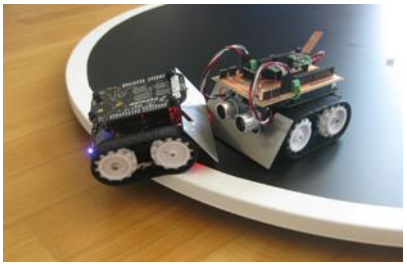

Figure 1 - SUMOBOT Competition

1.1 Problem statement

Sumo robot contests feature two robots trying to push each other out of a ring. The competitions are non-destructive, so our goal is to control the motors(wheels) to go towards the other robot and most importantly to stay in the ring.

1.2 The meta behind the project

Controlling DC motors and how to read IR sensors for line detection and Ultrasonic to read objects from a distance and how to get these signals and process them as will be listed after.

2 SUMOBOT / SUMO Robot design

if you want to build a functional Sumobot, you need three things: a sensory system to collect data, a processing system to convert data into behavior, and a motor output system to perform those behaviors.

The design will be divided into 3 co-dependent parts.

- Mechanical part.
- Electrical part.
- Software part.

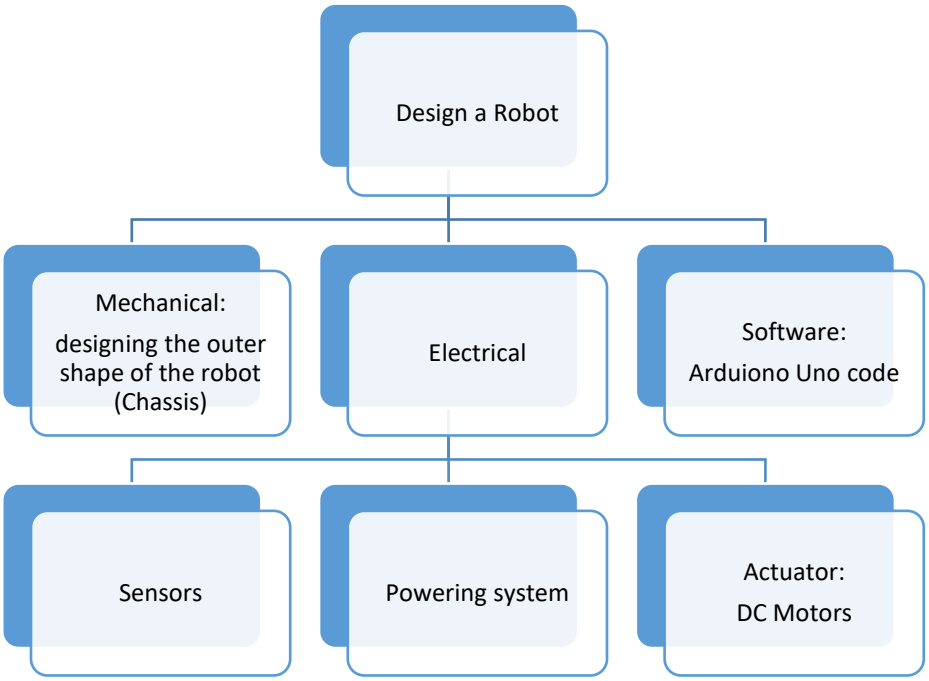

Figure 2 - Robot Design Map

2.1 Mechanical Design

A sumorobot powered by 2 wheels' motors and a 45º angled face as seen.

Figure 3 - Our robot

2.2 Electrical Design

How our robot will feel and act on the environment? In addition to that, and how everything will be powered.

2.2.1 Sensors

Sensors are robot's eyes to the environment. We will use ultrasonic sensor to detect the opponent's robot and light sensor (IR) to detect the white border of the ring and not to fall out of it.

2.2.1.1 Ultrasonic

Ultrasonic sensor uses TRIG and ECHO to send sound waves and return with the distance of the detected object so we use it to detect the other robot and how far is it from us.

Figure 4 - Ultrasonic

2.2.1.2 IR

We use IR module to detect the white line of the board as the output is the different color but we set it to be high and low for black and white respectively.

Figure 5 - IR modulo

2.2.2 Actuators

2.2.2.1 2 DC Motors

DC motors will drive the robot's wheels. They perform as the output of the system. Ours is 12 V and its maximum ampere is 1.7 A

Figure 6 - DC motor

2.2.2.2 Motor driver modulo l298n

This performs as an h-bridge to control the motors directions and PWM for the speed and easy to use with the Arduino

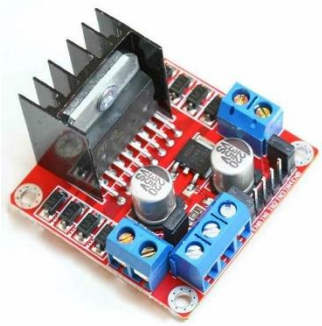

Figure 7 - Motor driver L298N

2.2.3 Power system

One powering systems for the robot for the Arduino and the l298n to the motors. We use the LI-ON batteries to feed our system as discussed. 3 of them each one is 3.7 volts.

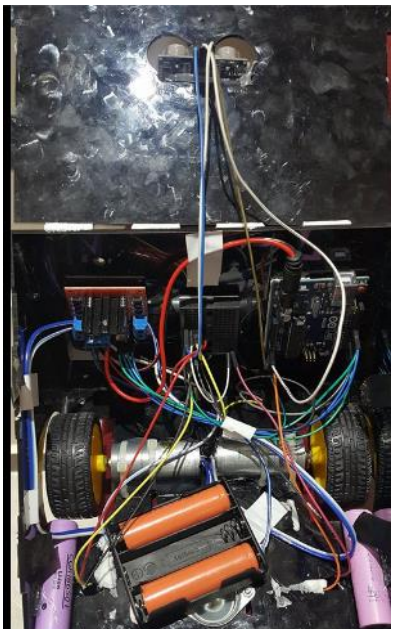

Figure 8 - Our robot from inside

2.3 Software design

Using Arduino as the controlling source “brain of the robot”. The Arduino's main program runs in a constant loop, checking its conditions over and over until the machine turns off. It is in this loop that we will execute our code. Our main goal is to build a suitable code to control the robot. You can see code in references

3 Refrences

Simply sumobot report / book

Arduino.cc

Wikipedia