Jose Rizal University

Sumo Robot

A Documentation Submitted to the
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In Partial Fulfillment
Of the Requirements for the Degree

Bachelor of Science in Computer Engineering

By

WARRIORS

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Introduction

Objectives of the Study

The general objective of this study is to develop a SumoBot.
Specifically, this study is aimed at:possible for a single robot to defeat the other within the bout time limit by pushing it out of the arena or immobilizing it by tilting, disabling, or overturning it.

Project Research Design

The research design is the overall approach you select to combine the various elements of the study in a logical and cogent manner, ensuring you will successfully solve the research problem. It serves as the guide for the data gathering, measurement, and analysis processes.

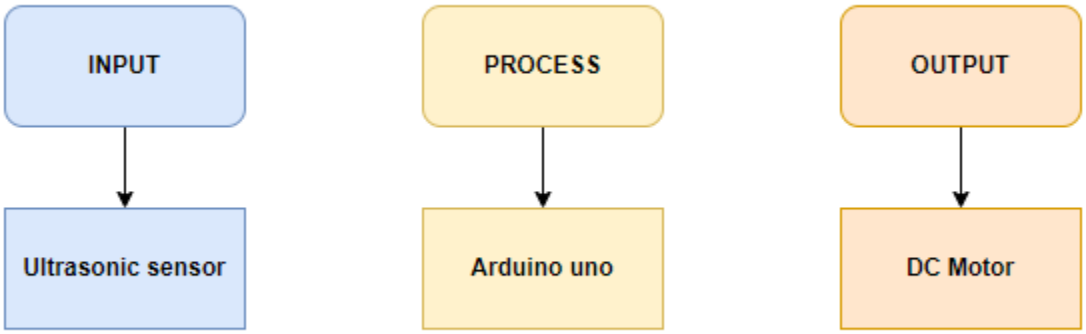
Constructive Research Method is used for this research study. The Constructive Research Method is the most commonly used in Computer Science related research. The goal of constructive research is to validate through the use of construction of the prototype to be tested. In this study, a line follower robot that aims to have the fastest line follower.

Figure 1. Research Design

The Constructive research method is composed of six different stages. It includes selecting practically relevant problems with research potential, obtaining a pre-understanding of the topic, designing the solution that deals with the proposed solution output, testing phase, theoretical connection and research contribution, and Evaluating the scope of applicability.

Conceptual/ Theoretical Framework

Figure 2. Conceptual Framework



As shown in Figure 2, The ultrasonic sensor is used to locate the opponent's robot and is usually placed at the top of the robot. are connected to Arduino uno and DC motors that will help the line follower robot to have precise motion.

Project Development

Project development is a procedure that molds an idea into a working project. Information can be gathered from websites and first hand basis. In this study, the researcher will conduct a survey that will gather information about the SumoBot and utilize the software and hardware components.

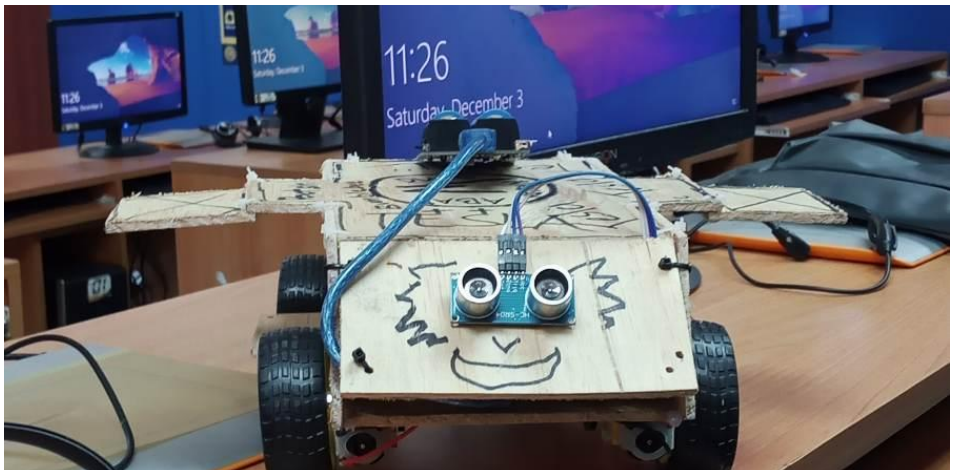


Figure 3 Project Development

Figure 3. shows the progression of the project. The first step is scope analysis, in which the researcher evaluates the project's potential outcomes and level of completion. The requirement analysis that follows will cover the project's requirements and features. Following a project requirements analysis, the design will be created, and the researcher will next construct a project prototype. The user will put the prototype through a lot of testing in order to determine whether it needs improvement or not. The prototype will then undergo extensive testing, and if it has proven to be reliable, the researcher will consider it to be a finished product.

Hardware Design

Figure 4 Arduino Uno

Figure 4. An Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. It is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

Figure 5 UltraSonic Sensor

Figure 5. An electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal.

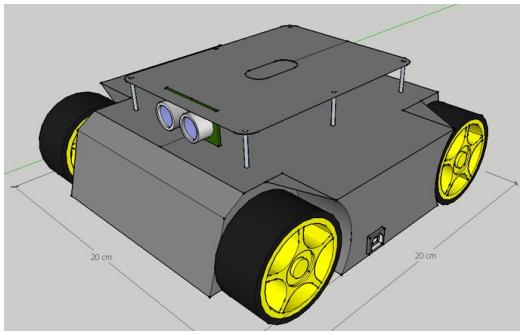


Figure 6 Chassis of SumoBot

Figure 6. A chassis is a special design robot body that you can use for Line Following Robot projects.

Figure 7 Wheels of Line Follower Robot

Figure 7. The wheels are very lightweight, so a large amount of torque is still left to accelerate your robot. These wheels are uniformly round so there will be no bumps to your robot while on the move.

Figure 8 Jumper wires

Figure 8. The Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering.

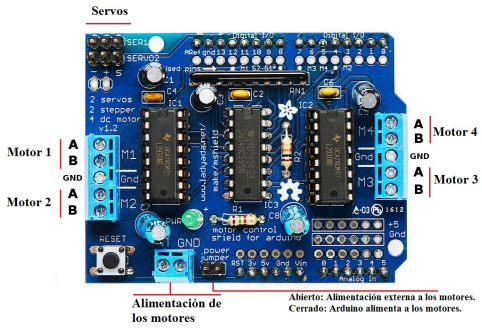


Figure 9 Arduino MotorShield

Figure 9. The robot's motors are driven by the Motorshield module. On the basis of the data transmitted by the IR Sensors, it receives signals from the Arduino Uno Board.

Figure 10 Rechargeable battery with case

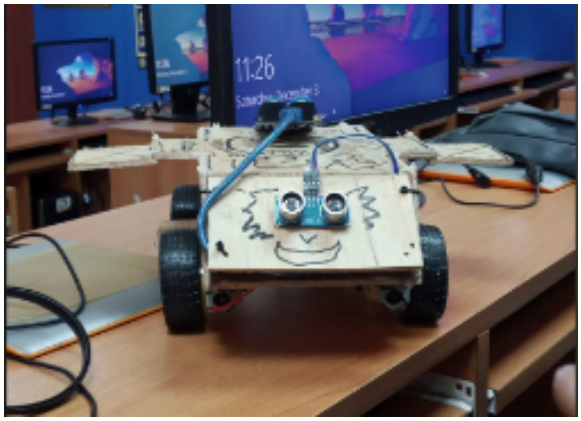
Figure 10. In contrast to a disposable or main battery, which is delivered fully charged and discarded after use, a rechargeable battery is a type of electrical battery that may be charged, discharged into a load, and recharged numerous times.

Figure 11 DC Motor

Figure 11. is referred to as a battery-powered motor. These motors are frequently employed in hobby-grade applications when a small DC motor is needed as a straightforward actuator.

Software Design and Development

Arduino IDE. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It functions on Linux, Mac OS X, and Windows. The environment is created using Processing and other open-source technologies and is written in Java. Any Arduino board can be used with this software.



System Flowchart

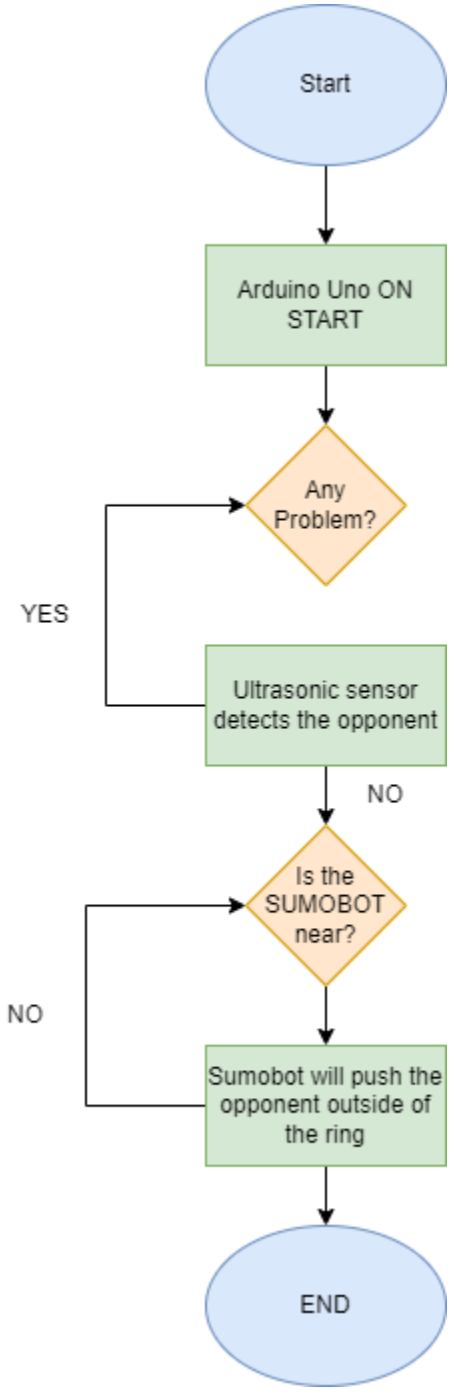


Figure 12 System Flowchart

In Figure 12**.** The Arduino Uno is turned on to begin the system. Wheels and a dc motor are connected to a battery to power up the robot. The robot has a mounted Ultrasonic sensor. The sensors are used to detect opponent robots and avoid the lines.

On the other hand, when the robot detects the opponent it will push it until it goes outside the ring.

Codes:

```
#include Ultrasonic.h

#include <AFMotor.h>
AF_DCMotor motor1(1);
AF_DCMotor motor2(2);
AF_DCMotor motor3(3);
AF_DCMotor motor4(4);
int trigPin = 9;
int echoPin = 10;
int davomiylik, sm;
#define lefts A4
#define rights A5

void plusUltra() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(15);
  digitalWrite(trigPin, LOW);
  davomiylik = pulseIn(echoPin, HIGH);
  sm = davomiylik / 58;
}

void setup() {
  //Serial.begin(9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  delay(5000);
  motor1.setSpeed(255);
  motor1.run(RELEASE);
  motor2.setSpeed(255);
  motor2.run(RELEASE);
  motor3.setSpeed(255);
  motor3.run(RELEASE);
  motor4.setSpeed(255);
```

```
  motor4.run(RELEASE);

}

void loop() {
plusUltra();
  //Serial.println(sm);
  if (sm > 1 && sm < 50) {
    motor1.run(FORWARD);
    motor2.run(FORWARD);
    motor3.run(FORWARD);
    motor4.run(FORWARD);
    delay(300);
  } else {
    motor1.run(BACKWARD);
    motor2.run(FORWARD);
    motor3.run(BACKWARD);
    motor4.run(FORWARD);
    delay(10);
  }
}
```

Conclusion:

In this project, we concluded that with the use of ultrasonic sensors, it helps locate the other sumo bots position in order for the motors to work and engage into the other sumo bot which is how it should work. The IR sensor can also help by adding it to the back and adding the IR sensor code inside and how it should work when it detects the black line in order for it to move inside and away from the black line for it to avoid losing.

Recommendation:

In this section the group will have recommendations for future sumo bot projects.

Recommendations:

- Provide more power sources by adding more batteries.
- Parallel circuit to avoid overheating components.
- Use much stronger casing.
- Create a program to find and attack the opponent.

REFLECTION

James Frederic Dulo

Sumobot is just like a line follower robot but we added proximity sensor which is the ultrasonic sensor. In this activity, we have learned the difference and proper application of the two sensors. Also, we added more electrical power for our robot to have its ability to push and crash with the opponent. We also design a casing for our robot which will make it more strong and protect components that are inside and mounted in the chassis. During the testing phase we tried different combinations of codes in detecting opponents and avoiding lines. We also added 2 wheels to make it 4 and provide more balance and stability. On the day of competition, our robot loses but we manage to win an award of best casing.

Abad, Arvenell B.

The process of creating the sumobot and the process of creating the line follower was different from each each other because those two have different components which is new to us which also makes us a newbie in the process of creating the case and combining the new components that we bought to the previous components that we used in the line follower robot. In the time of creating the sumobot, Our group members did one unique task in creating the robot, one created the case which is made with plywood and after creating the case we all started to buy the components for the sumo both which it is our first time handling those new components so we searched up on youtube some sumo bot videos to help us give idea on how we will be starting to create our own sumobot. After all the time of creating the case and putting all the components together, we finally finished the sumo bot in time but not totally finished so it has some minor stuff for it to work 100%. But still we managed to make it work.

Nicolan, Gelan M.

Creating a sumo robot and fighting against others could be fun, especially if you have access to any materials or resources. I suppose that is the enjoyable part about building a sumobot. Also, if they fit within your budget, you should learn more about what is on the market to provide your robot the best performance. and for sensors we ensure the sensor's sensing range, and we used plywood to cover our sumo bot also used for defense and offense to trick the opponents.

Calvero, Harry P.

Line follower and sumobot processes differ slightly because new components were added to sumobot to make it stronger and better able to detect some objects in front of it. First, we got different ideas on how to start building the Sumobot because we added new components to it. We all helped each other, starting from making the case of our sumobot to placing its components. In this process, we had a hard time because at first our sensor could not detect anything and the battery overheated. But it didn't take long for our robot to work, just in case there were minor issues in the operation of our robot. There was a competition, and even though we lost, we were happy because everyone had experience in building this robot, and we also learned where we went wrong and how we can address it.

SUMOBOT VIDEOS AND PICTURES
https://drive.google.com/drive/folders/1M0PiBLxqmwZGLHbrMrmoogcxkbRpUaN5?usp=sharing