University of Bohol
College of Engineering and Technology
Computer Engineering Department

First Semester

SUMOBOT

CPEP 316 – Computer Engineering Drafting and Design

In partial fulfillment of the requirements for the degree of

Bachelor of Science in Computer Engineering

Submitted to:

Engr. Victor John L. Anunciado, CpE

Instructor

Submitted by:

John Claidy Ken O. Taguran

December 2023

Introduction

In the modern era of rapid technological advancement, robotics has seamlessly integrated into our daily lives, assuming various roles from industrial applications to healthcare assistance. Moreover, its influence has extended into the realm of sports, exemplified by innovations like Sumobot. Sumobot, a diminutive robotic contender in the style of sumo wrestling, not only provides entertainment but also offers multifaceted advantages. This game cultivates vital skills such as critical thinking, problem-solving, technical proficiency, and teamwork as participants design and construct their own robots. Moreover, Sumobot serves as an engaging gateway to the world of robotics, potentially igniting interest in pursuing careers within this dynamic and expanding industry.

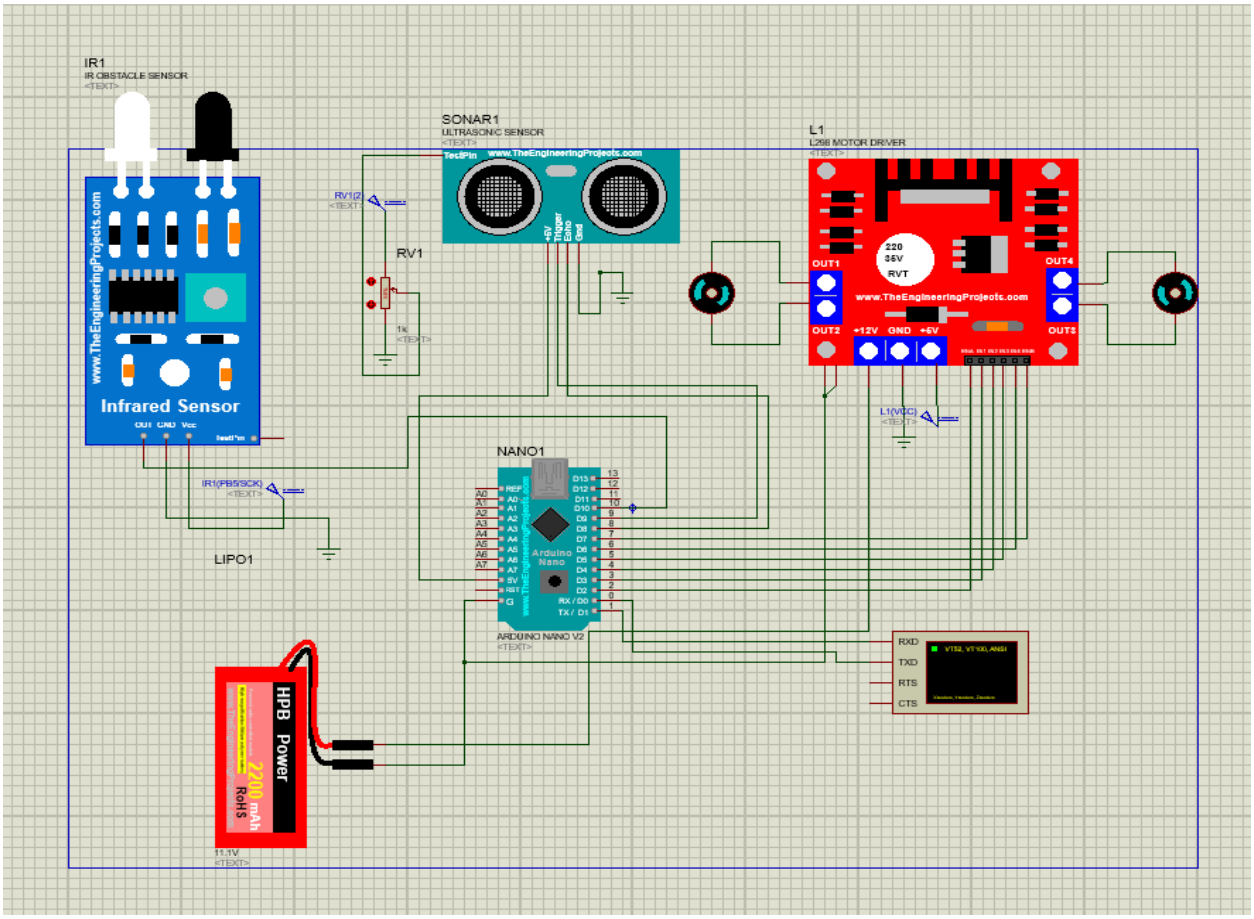
In this Sumobot Project, we have used the following tools, equipment, materials, and components:

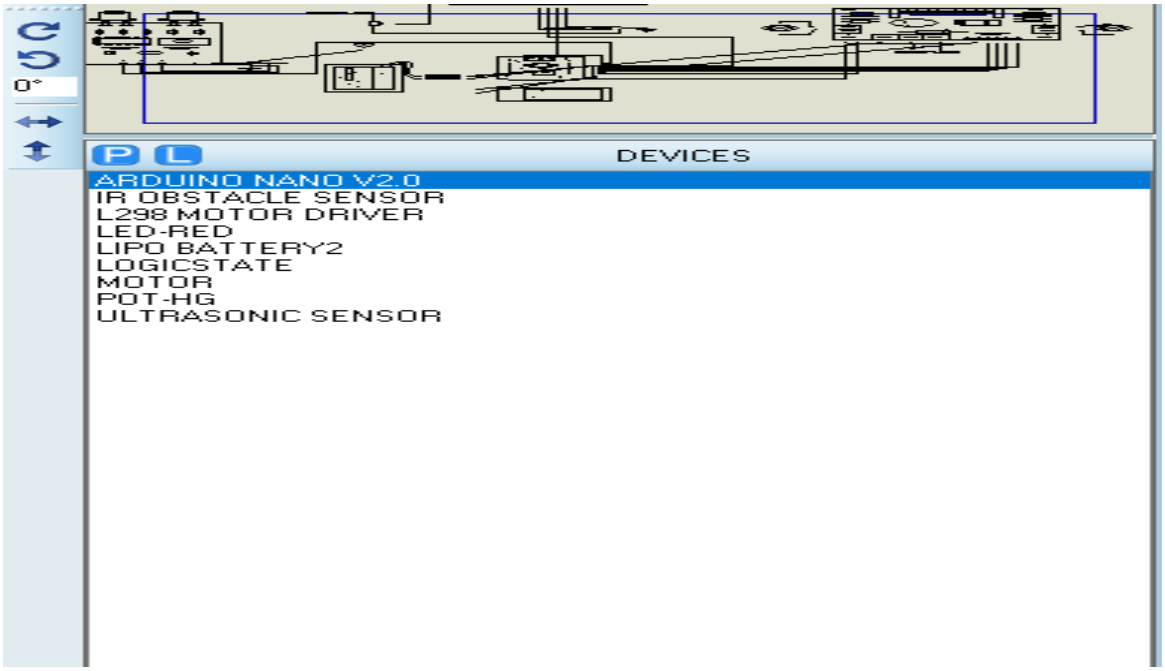
- **Proteus** - Proteus is a software tool used for electronic circuit simulation. It allows you to design and test electronic circuits before building them, helping you identify and correct errors early in the design process. Proteus is the software I have used in creating my schematic diagram for my Sumobot.
- **Arduino IDE** - The open-source Arduino Software (IDE) makes it easy to write and upload code to the board. This software can be used with any Arduino board and in my case, I am using a Nano one.

- **MCU (Arduino Nano)** – This is the microcontroller unit that serves as the brain of the sumobot. It is responsible for controlling the various sensors and motors.
- **Rechargeable Battery (18650) –** This is the power source for the sumobot. It is rechargeable and provides enough power to drive the motors and run the sensors.
- **Battery Holder -** This is a container that holds the rechargeable battery securely in place.
- **Motor Controller –** This is the component that controls the speed and direction of the DC geared motor.
- **DC Geared Motor –** These are the motors that drive the wheels of the sumobot. They are powerful enough to move the sumobot around the arena.
- **Wheels –** These are the components that provide traction and allow the sumobot to move around the arena.
- **Chassis (PVC - Polyvinyl Chloride) –** This is the frame of the sumobot. It is made of PVC and provides a sturdy base for all the other components.
- **Ultrasonic Sensor –** This is a sensor that emits high-frequency sound waves and measures the time it takes for the waves to bounce back. It is used to detect obstacles in the arena.
- **IR Sensor –** This is a sensor that detects the presence of other sumobots in the arena. It is used to detect the opponent and avoid collisions.
- **Boost/Back Converter –** This is a device that converts the voltage of the battery to a higher or lower voltage, depending on the requirements of the other components.

- **Connecting Wires –** These are the wires that connect the various components of the sumobot.
- **Universal PCB -** This is a circuit board that allows the components of the sumobot to be connected.
- **IC Header Pins -** This is a component that allows the various sensors and motors to be connected to the PCB.
- **Drill –** a hand-held tool used for making holes in various materials. In the case of making a sumobot chassis, it can be used to create holes for mounting components such as motors and sensors.
- **Heat Gun –** is a tool that produces a stream of hot air. It is commonly used in electronics to shrink heat shrink tubing and soften adhesives. In the context of sumobot chassis making, it can be used to soften plastic sheets and shape them to the desired form.
- **Electric Rotary Cutter -** a power tool that spins a circular blade at high speeds. It is used for cutting through various materials such as fabric, plastic, and metal. When making a sumobot chassis, it can be used to cut plastic sheets to the desired size and shape.
- **Nuts and Bolts -** are essential hardware components used in constructing mechanical devices such as sumobot chassis. Bolts, on the other hand, are externally threaded fasteners that are used to hold components together. When constructing a Sumobot chassis, nuts and bolts are commonly used to secure motors, sensors, wheels, and other components in place.

Schematic Diagram





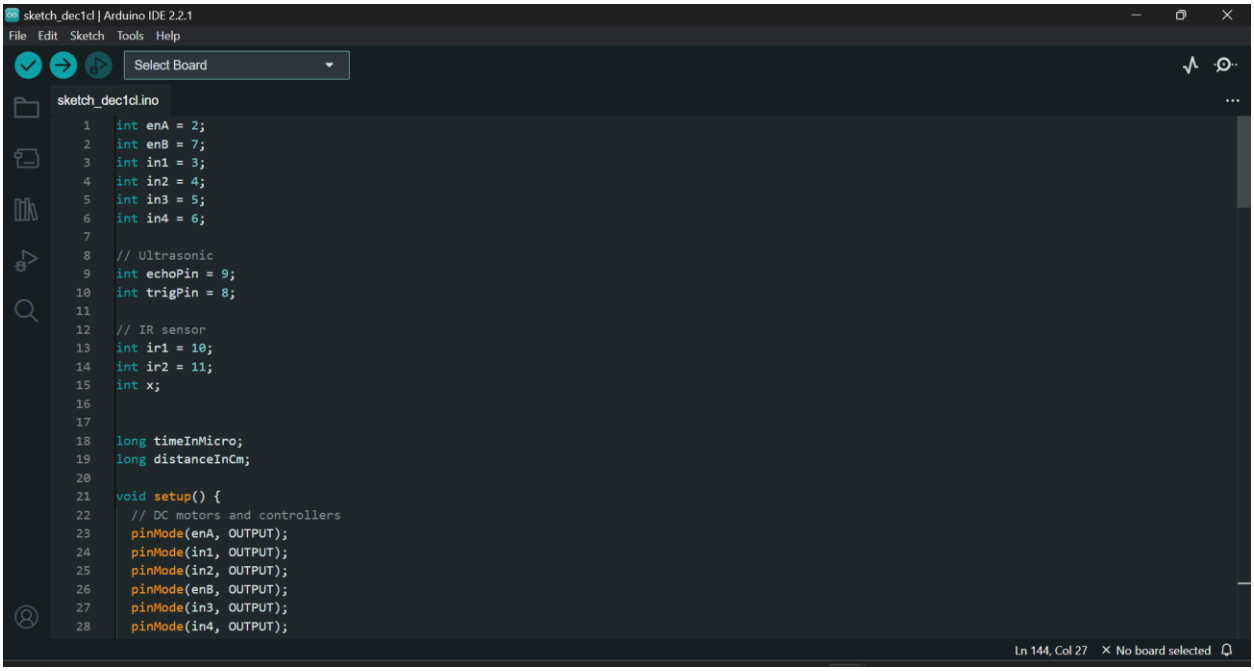
Code using Arduino IDE

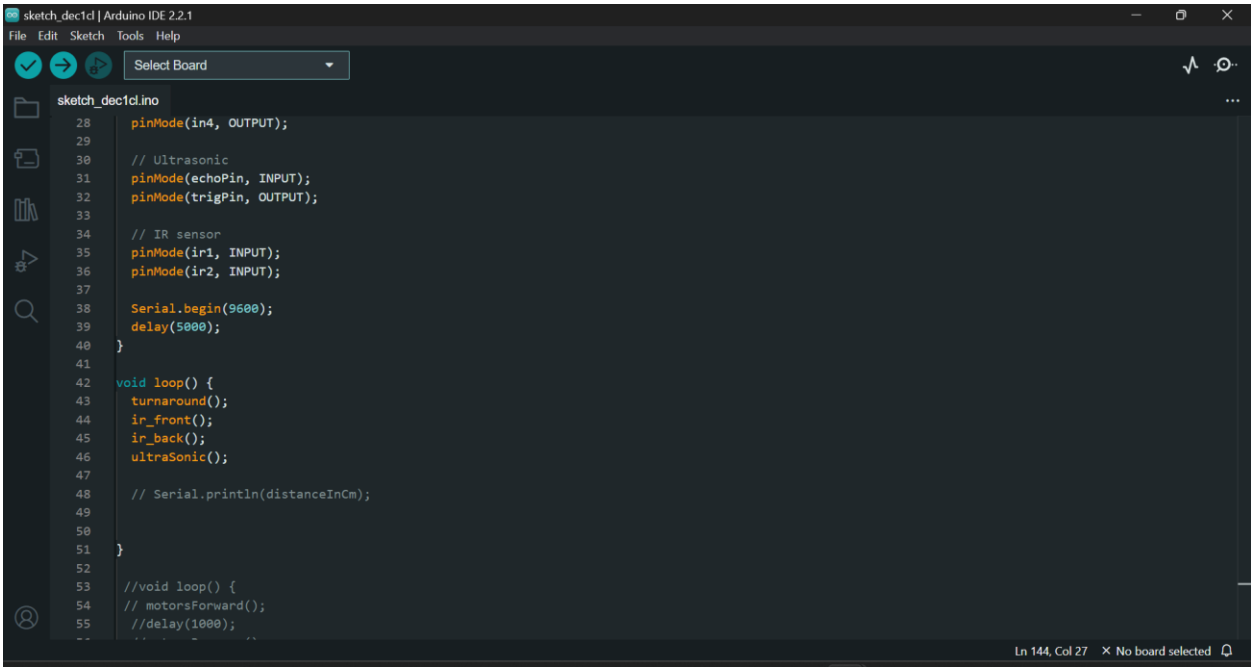
```
int enA = 2;
int enB = 7;
int in1 = 3;
int in2 = 4;
int in3 = 5;
int in4 = 6;

// Ultrasonic
int echoPin = 9;
int trigPin = 8;

// IR sensor
int ir1 = 10;
int ir2 = 11;
int x;

long timeInMicro;
long distanceInCm;

void setup() {
// DC motors and controllers
pinMode(enA, OUTPUT);
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(enB, OUTPUT);
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);

// Ultrasonic
pinMode(echoPin, INPUT);
pinMode(trigPin, OUTPUT);

// IR sensor
pinMode(ir1, INPUT);
pinMode(ir2, INPUT);

Serial.begin(9600);
delay(5000);
}

void loop() {
turnaround();
ir_front();
ir_back();
ultraSonic();
```

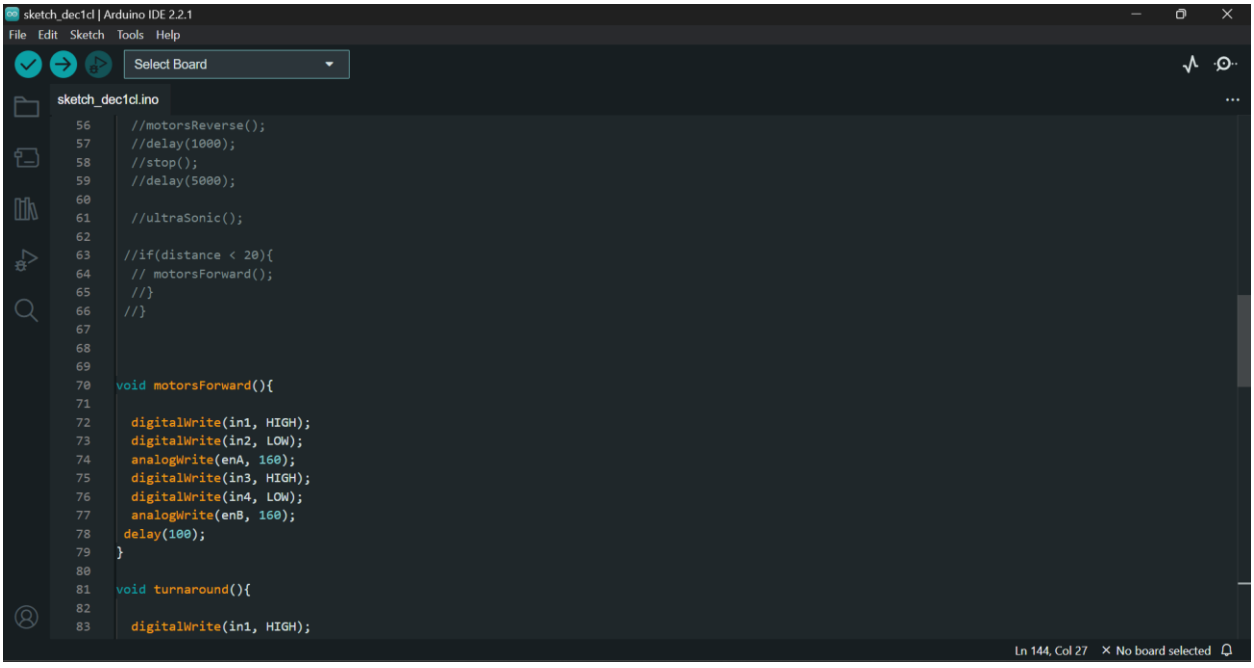
```
// Serial.println(distanceInCm);

}
//void loop() {
// motorsForward();
//delay(1000);
//motorsReverse();
//delay(1000);
//stop();
//delay(5000);

//ultraSonic();

//if(distance < 20){
// motorsForward();
//}
//}

void motorsForward(){

digitalWrite(in1, HIGH);
digitalWrite(in2, LOW);
analogWrite(enA, 160);
digitalWrite(in3, HIGH);
digitalWrite(in4, LOW);
analogWrite(enB, 160);
delay(100);
}

void turnaround(){

digitalWrite(in1, HIGH);
digitalWrite(in2, LOW);
analogWrite(enA, 140);
digitalWrite(in3, HIGH);
digitalWrite(in4, HIGH);
analogWrite(enB, 0);
delay(100);
}

void motorsReverse(){

digitalWrite(in1, LOW);
digitalWrite(in2, HIGH);
analogWrite(enA, 160);
digitalWrite(in3, LOW);
digitalWrite(in4, HIGH);
```

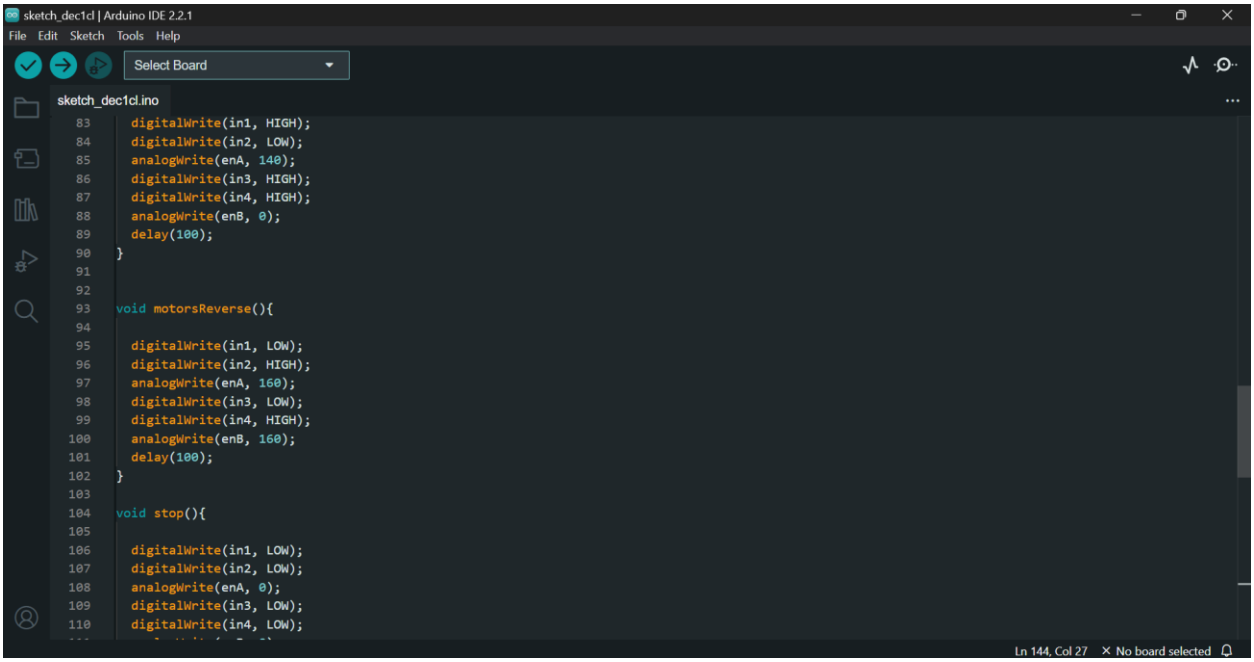
```
analogWrite(enB, 160);
delay(100);
}

void stop(){

digitalWrite(in1, LOW);
digitalWrite(in2, LOW);
analogWrite(enA, 0);
digitalWrite(in3, LOW);
digitalWrite(in4, LOW);
analogWrite(enB, 0);
delay(100);
}

void ultraSonic(){
// int duration, distanceInCm;
digitalWrite(trigPin,LOW);
delayMicroseconds(5);
digitalWrite(trigPin,HIGH);
delayMicroseconds(10);
digitalWrite(trigPin,LOW);

timeInMicro = pulseIn(echoPin,HIGH);

distanceInCm = ((timeInMicro/36)/2);
if (distanceInCm < 30)
{

// Serial.println("detetcettsa");
motorsForward();
}

}
void ir_front() {
if (digitalRead(ir1)) {
Serial.println('detect');
}
else {
digitalWrite(in1, LOW);
digitalWrite(in2, HIGH);
analogWrite(enA, 160);
digitalWrite(in3, LOW);
digitalWrite(in4, HIGH);
analogWrite(enB, 160);
}
}
void ir_back() {
```

```
if (digitalRead(ir2)) {
Serial.println('detect');
}
else {
digitalWrite(in1, LOW);
digitalWrite(in2, HIGH);
analogWrite(enA, 160);
digitalWrite(in3, LOW);
digitalWrite(in4, HIGH);
analogWrite(enB, 160);
}
}
```




sketch_dec1cl | Arduino IDE 2.2.1
File Edit Sketch Tools Help
Select Board
sketch_dec1cl.ino
pinMode(in4, OUTPUT);
// Ultrasonic
pinMode(echoPin, INPUT);
pinMode(trigPin, OUTPUT);
// IR sensor
pinMode(ir1, INPUT);
pinMode(ir2, INPUT);
Serial.begin(9600);
delay(5000);
}
void loop() {
turnaround();
ir_front();
ir_back();
ultraSonic();
// Serial.println(distanceInCm);
}
//void loop() {
// motorsForward();
//delay(1000);
Ln 144, Col 27
No board selected


sketch_dec1cl | Arduino IDE 2.2.1
File Edit Sketch Tools Help
Select Board
sketch_dec1cl.ino
//motorsReverse();
//delay(1000);
//stop();
//delay(5000);
//ultraSonic();
//if(distance < 20){
// motorsForward();
//}
//}
void motorsForward(){
digitalWrite(in1, HIGH);
digitalWrite(in2, LOW);
analogWrite(enA, 160);
digitalWrite(in3, HIGH);
digitalWrite(in4, LOW);
analogWrite(enB, 160);
delay(100);
}
void turnaround(){
digitalWrite(in1, HIGH);
Ln 144, Col 27
No board selected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digitalWrite(in2, LOW);
analogWrite(enA, 140);
digitalWrite(in3, HIGH);
digitalWrite(in4, HIGH);
analogWrite(enB, 0);
delay(100);
}
void motorsReverse(){
digitalWrite(in1, LOW);
digitalWrite(in2, HIGH);
analogWrite(enA, 160);
digitalWrite(in3, LOW);
digitalWrite(in4, HIGH);
analogWrite(enB, 160);
delay(100);
}
void stop(){
digitalWrite(in1, LOW);
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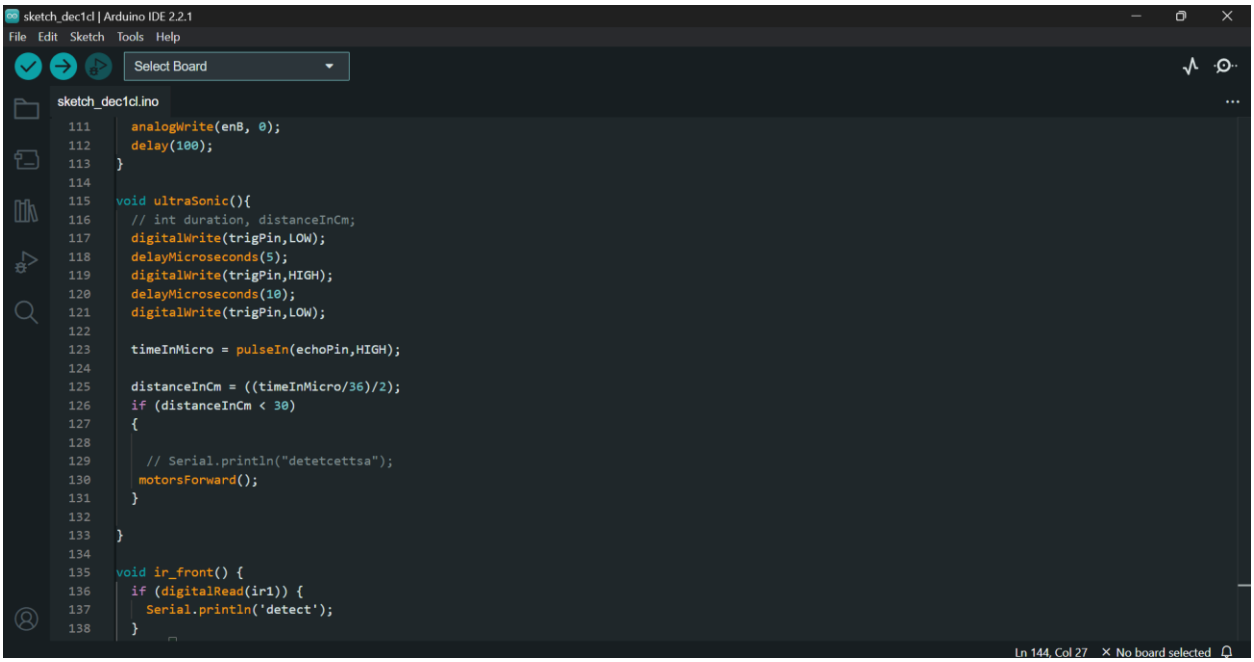
analogWrite(enA, 0);
digitalWrite(in3, LOW);
digitalWrite(in4, LOW);
Ln 144, Col 27
No board selected


sketch_dec1cl | Arduino IDE 2.2.1
File Edit Sketch Tools Help
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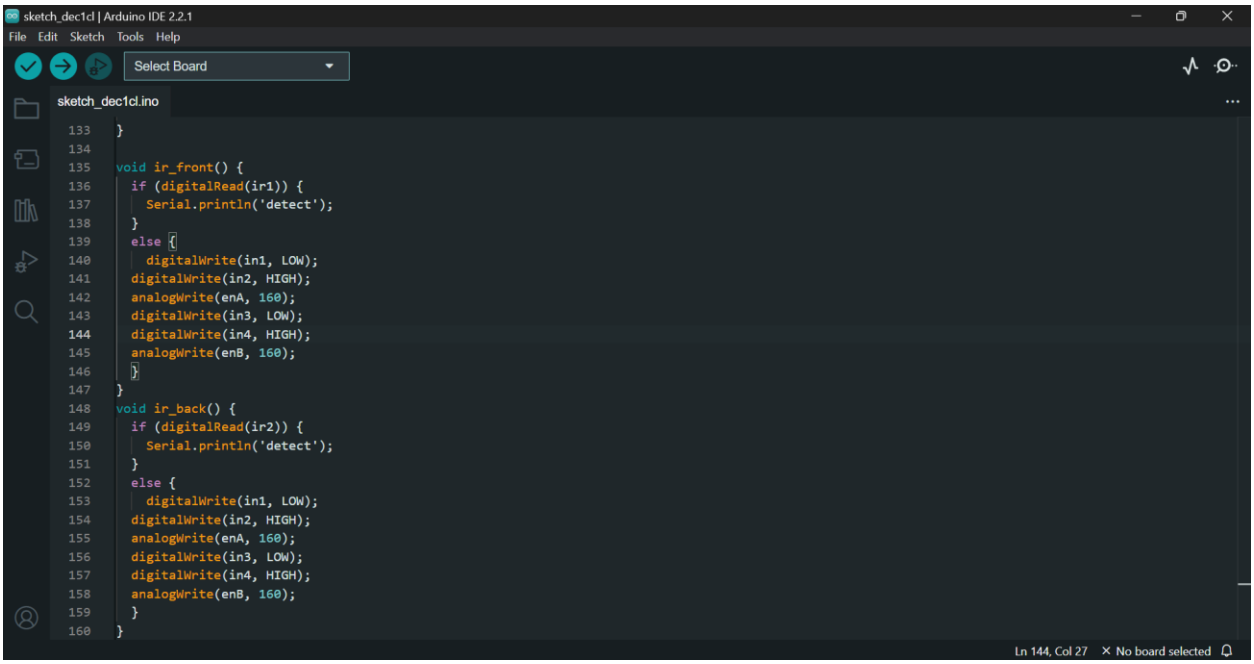
analogWrite(enB, 0);
delay(100);
}
void ultraSonic(){
// int duration, distanceInCm;
digitalWrite(trigPin,LOW);
delayMicroseconds(5);
digitalWrite(trigPin,HIGH);
delayMicroseconds(10);
digitalWrite(trigPin,LOW);
timeInMicro = pulseIn(echoPin,HIGH);
distanceInCm = ((timeInMicro/36)/2);
if (distanceInCm < 30)
{
// Serial.println("detetcettsa");
motorsForward();
}
}
void ir_front() {
if (digitalRead(ir1)) {
Serial.println('detect');
}
Ln 144, Col 27
No board selected



Materials and Costing

Quantity	Material	Cost (Peso)	Total Amount
1	MCU (Arduino Nano)	200.00	200.00
3	Battery 18650	24.00 each	72.00
1	Battery Holder	40.00	30.00
1	Motor Controller	65.00	65.00

2	DC Geared Motor & Wheels	69.00 each (Joint together)	138.00
	Chassis (PVC)	Recycled	0.00
1	Ultrasonic Sensor	37.00	37.00
2	IR Sensor	25.00	50.00
1	Back/Boost Converter	65.00	65.00
	Connecting Wires	25.00 F-F 25.00 M-F	50.00
1	Universal PCB	20.00	20.00
1	IC Header	18.00	18.00
	Drill, Heat gun, Rotary Cutter, and all tools used	Borrowed	
	Nuts and Bolts	25.00	25.00
Note: Trials and errors are not included.			**Total: 770.00**

Receipts

Shopee shop links:

Arduino Nano –

〉 https://shp.ee/jcn5iag

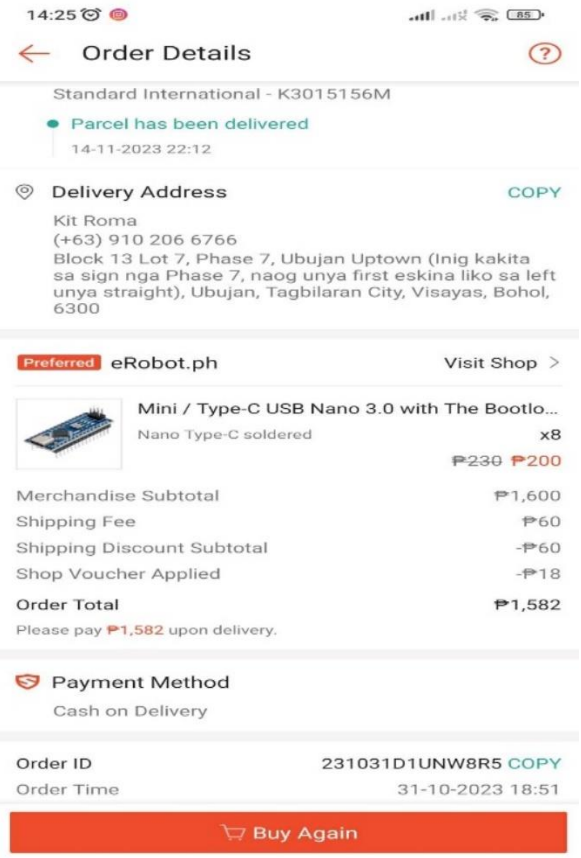
Battery –

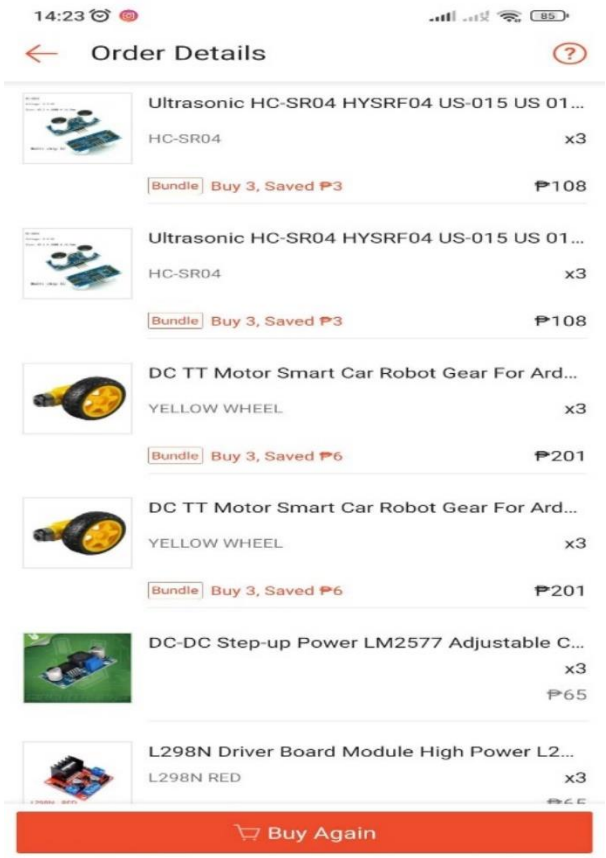
〉 https://shp.ee/9ktdv0l

Most of the components -

〉 https://shp.ee/kyfq2le

Note: All orders being purchased were purchased on a bundle so we have availed a bundle of discounts and also shipping discounts.





14:24

Order Details

unya straight), Ubujan, Tagbilaran City, Visayas, Bohol, 6300

Preferred circuitrocks Visit Shop >

Ultrasonic HC-SR04 HYSRF04 US-015 US 01...
HC-SR04 x3
Bundle Buy 3, Saved ₱3 ₱108

Ultrasonic HC-SR04 HYSRF04 US-015 US 01...
HC-SR04 x3
Bundle Buy 3, Saved ₱3 ₱108

DC TT Motor Smart Car Robot Gear For Ard...
YELLOW WHEEL x3
Bundle Buy 3, Saved ₱6 ₱201

DC TT Motor Smart Car Robot Gear For Ard...
YELLOW WHEEL x3
Bundle Buy 3, Saved ₱6 ₱201

DC-DC Step-up Power LM2577 Adjustable C...
x3
₱65

Buy Again

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Order Details

₱25

Jumper Wires Dupont Line Male To / Femal...
F-M 10CM x1
₱25

Jumper Wires Dupont Line Male To / Femal...
F-F 10CM x1
₱25

Jumper Wires Dupont Line Male To / Femal...
M-M 20CM x1
₱35

Battery Holder Aa 18650 1S / 2S 3S 4S Sing...
18650 3S x3
₱49

Infrared IR Line Tracing Obstacle Avoidance...
Obstacle Avoidance x6
₱25

Merchandise Subtotal	₱1,415
Shipping Fee	₱187
Shipping Discount Subtotal	-₱100
Order Total	₱1,502

Please pay ₱1,502 upon delivery.

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Order Details

SPX Express - SPEPH03820192486B

Parcel has been delivered
21-11-2023 12:58

Delivery Address COPY

Kit Roma
(+63) 910 206 6766
Block 13 Lot 7, Phase 7, Ubujan Uptown (Inig kakita sa sign nga Phase 7, naog unya first eskina liko sa left unya straight), Ubujan, Tagbilaran City, Visayas, Bohol, 6300

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1PC Mini Fan 3.7V 18650 Rechargeable Bat...
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Merchandise Subtotal	₱552
Shipping Fee	₱141
Shipping Discount Subtotal	-₱80
Shop Voucher Applied	-₱5
Order Total	₱608

Please pay ₱608 upon delivery.

Payment Method

Cash on Delivery

Order ID 231115KQQVXN8Y COPY

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Hurdles

Embarking on the journey of creating a Sumobot, I found myself daunted by the task ahead. Uncertainty loomed as I grappled with the amalgamation of software and hardware requirements, causing me to question my capabilities and indulge in overthinking. Despite having prior programming experience, the complexity of this endeavor felt entirely different.

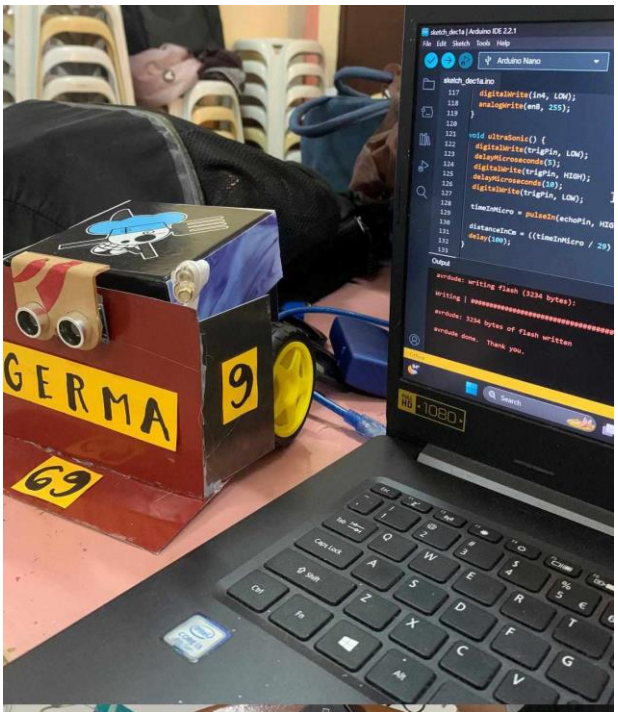
As I delved into the project, hurdles presented themselves at every turn. Yet, with the invaluable guidance and support of our instructor, who imparted knowledge on the intricacies of functionality and schematics, the path became clearer. Manipulating components proved to be particularly challenging, as even the most impeccable code could falter if the hardware was faulty. Thus, I learned the importance of meticulous attention to detail and the necessity of ensuring proper connections.

Through perseverance and iterative refinement, I managed to construct a rudimentary Sumobot with basic forward and backward motion capabilities. Initial tests yielded smooth performance, yet upon subsequent modifications to the code, I encountered an unexpected issue: one of the wheels began to function sluggishly, signaling a damaged gear. Promptly addressing the issue by acquiring a replacement and executing repairs, I adopted a newfound vigilance in verifying component connections.

On the day of the competition, a sense of gratitude washed over me as my Sumobot navigated the ring without incident. Despite its shortcomings, it valiantly battled and emerged victorious in two matches. Though the journey felt fleeting, the sense of achievement was undeniable.

Reflecting on the experience, I recognize it as a profound learning opportunity enriched by the myriad obstacles overcome. Armed with newfound knowledge and resilience, I carry forward the lessons learned, prepared to tackle future challenges head-on.

Documentation

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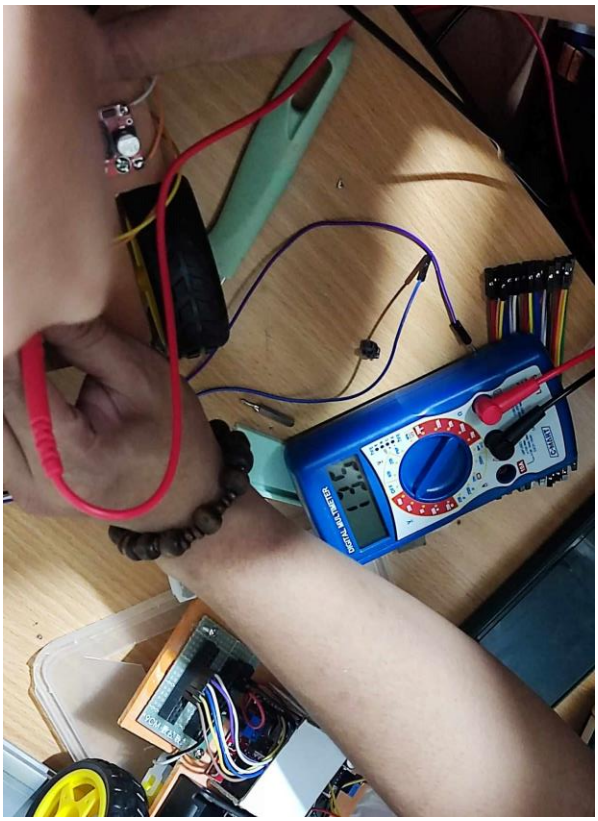
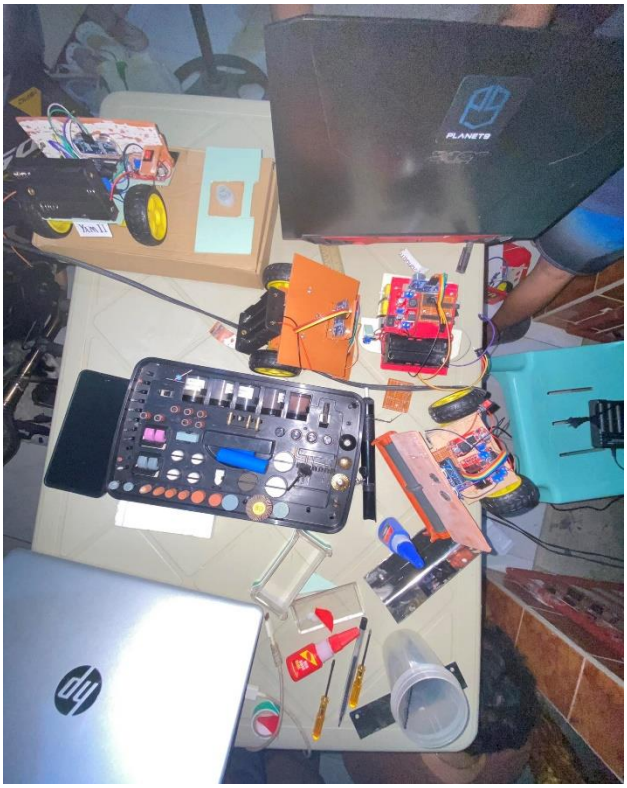
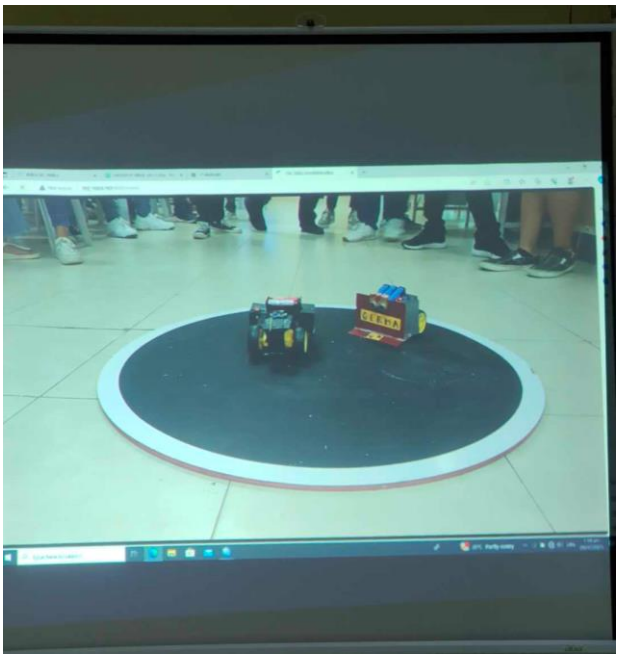



PLANETS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COMPFESTA

Curriculum Vitae

Name: John Claidy Ken O. Taguran

Nickname: Ken-ken

Age: 20 years old

Birthday: May 15, 2003

Address: Poblacion Baclayon Bohol

Contact Number: 09497629625

Email: jckotaguran@universityofbohol.edu.ph

Mother's name: Marilyn O. Taguran

Father's name: John M. Taguran

Motto*: "EMBRACE THE NEW ITERATION OF YOURSELF; YOU DON'T ALWAYS HAVE TO BE A WARRIOR."*

Portfolio:
https://claidytaguran.github.io/porttaguran.github.io/