Deliverable 4 Report

by Hiba Ahmed

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ECTE 250: ENGINEERING DESIGN AND MANAGEMENT 2

Deliverable 4

Breadboard Prototype

SMART WALKING STICK

GROUP G

- *NANDINI RAJAGOPALAN* (7352888)
- *HIBA AHMED* (7299205)
- *MUJIDAT JIBRIN* (6710608)
- *AHBAB ELTAHIR* (6564264)
- *KARIM SAFARINI* (7391560)

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1. INTRODUCTION

Blind persons have several difficulties while navigating their surroundings, including the possibility of tripping or running into objects. This problem has been addressed through the development of a number of devices aimed at improving the mobility and independence of visually impaired people. However, the current development has a wider reach.

The smart walking stick directs blind persons in the right route by alerting them to any impediments in their path.

2. KEY FUNCTIONALITIES

These are the features of the product:

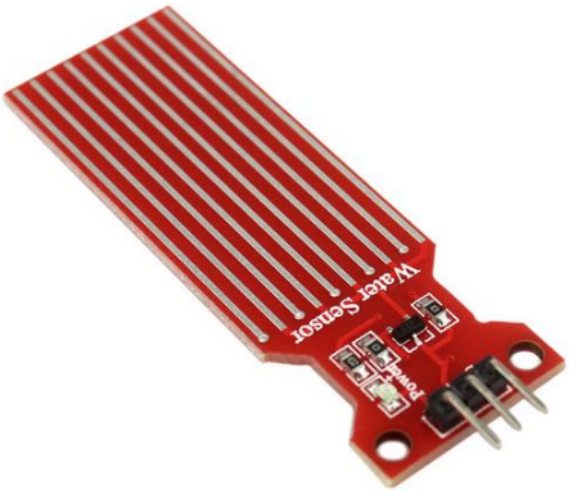
1. Detect any direct Obstacle.
2. Detecting Underground obstacles.
3. Detects Moisture
4. Alerts user about the obstacle (output)
5. Locate the walking stick if misplaced.

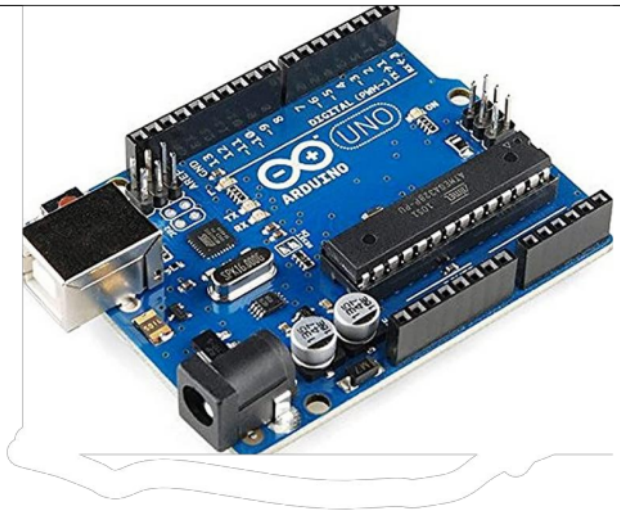
3. BREADBOARD PROTOTYPE CONSTRUCTION

1. **Choosing the right components**

   The team finalized the hardware components. The following components were used:

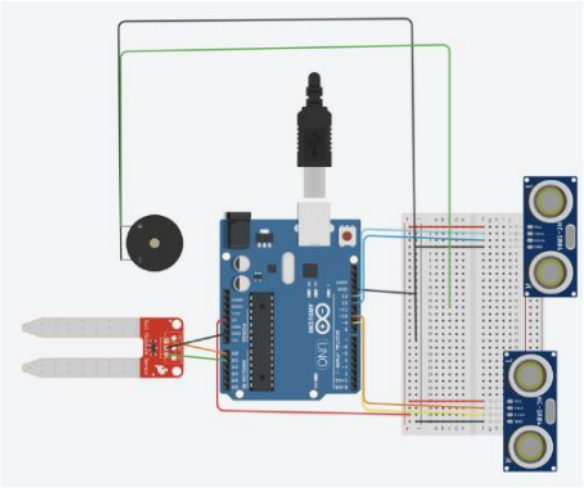
Component Name	Component Picture	Nos.

Ultrasonic Sensors		2
Water Sensor		1

Buzzer		1
Arduino UNO		1

2. Tinker Cad simulation

The simulation and code were constructed using TinkerCad and the testing phase was done similarly.

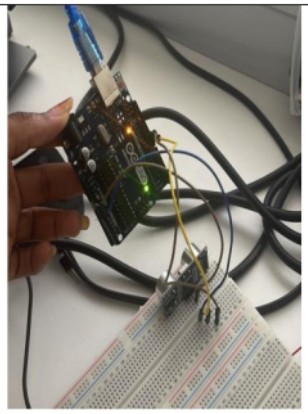
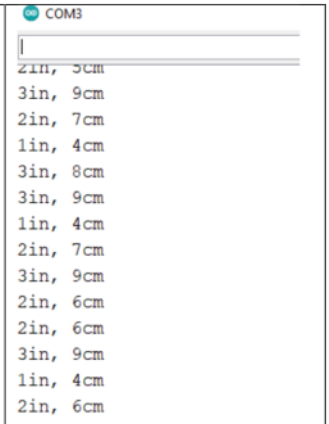


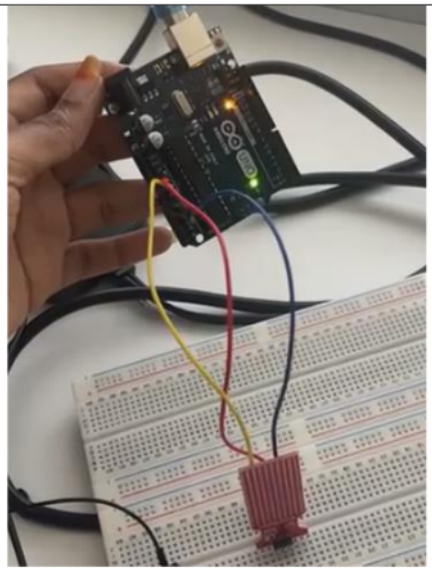
3. **Ordered Components**

The list of components was submitted to the lab instructor. All the components were received in 2 weeks.

4. **Individual testing of the components**

All the components were tested individually to check if they were working.

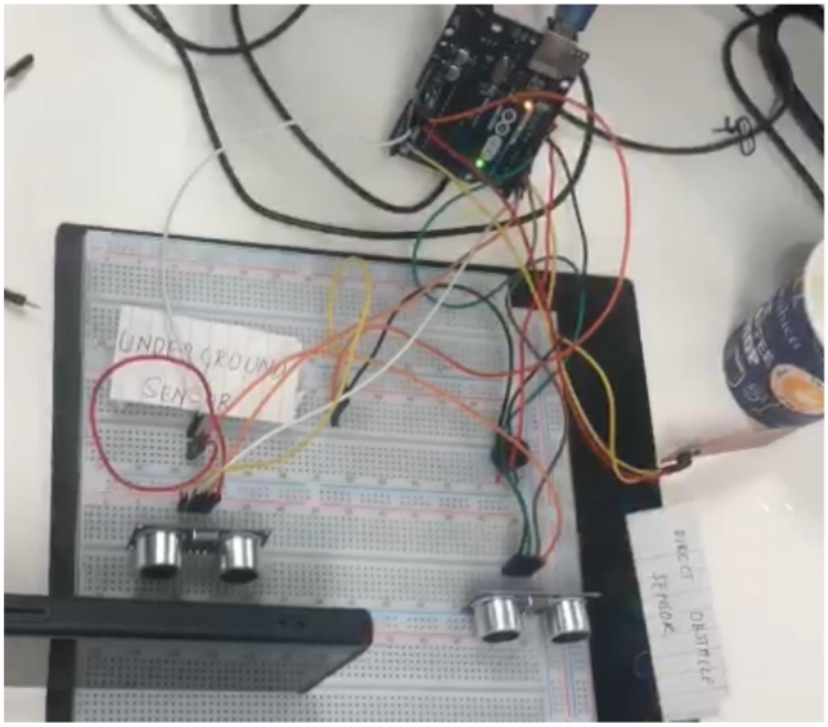
Ultrasonic Sensor		

Water Sensor		Water level: 0 Water level: 0 Water level: 0 Water level: 0 Water level: 80 Water level: 130 Water level: 260 Water level: 390 Water level: 411 Water level: 420 Water level: 435 Water level: 448 Water level: 485 Water level: 511 Water level: 521 Water level: 524 Water level: 533
Buzzer		The buzzer worked according to the tone mentioned in the code.

All the components were working.

5. Integrating all components in Arduino UNO

Hardware components for the output (Buzzer) and input (two ultrasonic sensors and one water level sensor) were linked to the microcontroller (Arduino UNO).



6. Programming all components

The code from TinkerCAD simulation was converted to execute on the Arduino IDE once the connection had been established. A few adjustments were made, nevertheless, to ensure that the circuit met the requirements.

```
const int buzzer = 11;

const int SIGNAL_PIN = A0;

const int POWER_PIN = 7;


float directcm = 0;

float undergroundcm = 0;

//float value = 0;
```

```
long readUltrasonicDistance(int triggerPin, int echoPin)
{
  pinMode(triggerPin, OUTPUT);  // Clear the trigger
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2000);
  // Sets the trigger pin to HIGH state for 10 microseconds
  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(1000);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);
  // Reads the echo pin, and returns the sound wave travel time in microseconds
  return pulseIn(echoPin, HIGH);
}



void setup()
{
  Serial.begin(9600);
  pinMode(buzzer, OUTPUT);
  pinMode(POWER_PIN, OUTPUT);   // configure D7 pin as an OUTPUT
  digitalWrite(POWER_PIN, LOW); // turn the sensor OFF
}
```

```
void loop()
{
 // measure the ping time in cm
 directcm = 0.01723 * readUltrasonicDistance(10, 9);
 undergroundcm = 0.01723 * readUltrasonicDistance( 5,6);
 digitalWrite(POWER_PIN, HIGH);  // turn the sensor ON
 delay(10);                      // wait 10 milliseconds
 int Value = analogRead(SIGNAL_PIN); // read the analog value from sensor
 digitalWrite(POWER_PIN, LOW);   // turn the sensor OFF
 Serial.println(Value);
 delay(1000);
 Serial.print(directcm);
Serial.println("cm");
 Serial.println("cm");
if ( directcm < 8 || undergroundcm > 10 || Value > 300) {
   for (int i = 0;  i < 4 ; i++) {
     tone(buzzer, 200);
     delay(500);
     noTone(buzzer);
     delay(500);
   }
 }
delay(500);
```

7. Testing Phase

The state diagram was used to test the hardware components, if the conditions are met, the appropriate output was observed.

4. MENTOR'S FEEDBACK:

The mentor's contribution to the team has been invaluable, as his dedication to reviewing their work in detail and providing constructive feedback has been greatly appreciated. The team recognizes the mentor's commitment and is grateful for the valuable insights and guidance he has provided.

In the development of Deliverable 4, the team took the mentor's comments into serious consideration. The publication associated with this deliverable serves as an overview of the project's design, highlighting the key aspects and providing a comprehensive understanding of the work undertaken.

The team received positive feedback from the mentor regarding Deliverable 3, which further motivated them. The mentor praised the report for its exceptional qualities, including being well-structured, persuasive, understandable, and fascinating. The team's effort in ensuring a clear and logical organization paid off, as the report effectively conveyed their thoughts and ideas in a coherent manner. The conclusion was particularly commendable, as it presented a concise and impactful message that left a lasting impression.

The team fully acknowledges the mentor's role in refining their idea and shaping it into a tool that promotes autonomy and security. To achieve this, they made certain modifications to the project to enhance its complexity and accessibility. These adjustments were specifically aimed at meeting the needs of the loved ones of visually impaired individuals. The resulting tool facilitates tracking of visually impaired individuals when they are separated, thereby ensuring their safety. Additionally, an

automated messaging feature was implemented to promptly alert the user in times of need or potential threats.

Recognizing the importance of effective utilization of the individual gadgets, the team placed emphasis on providing comprehensive knowledge and assistance for setting up the equipment. The object detection feature of the smart walking stick utilizes real-time algorithms for accurate object recognition. This advanced technology empowers visually impaired individuals to navigate both indoor and outdoor environments safely. Furthermore, the smart stick integrates user-friendly features to enhance its comfort and convenience, making it an indispensable companion.

The most significant advantage of using this innovative walking stick lies in its capability to detect hazards from a considerable distance, proactively alerting the user to potential obstacles. This exceptional feature ensures that visually impaired individuals can move around with confidence and independence, irrespective of the environment they are in.

Taking previous feedback from the mentor into account, the team focused on improving their referencing practices. They diligently adhered to recognized citation styles such as Harvard, APA, or IEEE when referencing external sources. This meticulous attention to detail ensures that the report includes accurate and appropriate references and citations, thereby acknowledging the sources used in their project.

Furthermore, the team proactively addressed the mentor's feedback concerning the pricing of the project's components. They meticulously

corrected the information to provide an accurate representation of the costs associated with implementing their idea. This attention to detail demonstrates their commitment to transparency and precision.

Overall, the team deeply values the mentor's involvement and appreciates the time and effort he has dedicated to their project. His feedback has been instrumental in shaping their work, refining their idea, and ensuring that the final product meets the highest standards. The team remains committed to incorporating the mentor's suggestions and guidance as they continue to work towards their goal of creating an innovative and impactful tool for visually impaired individuals and their loved ones.

5. CONCLUSION

The main purpose of our smart walking stick is to enable blind people to move safely and independently. The goal of this project is to design and create a cane that helps blind people identify hazards and navigate their environment safely. After warning the visually impaired about obstacles around them, our device guides the person in the intended direction. The team completed all milestones and tasks according to the plan. Completed flowchart, state diagram, block diagram, Tinkercad hardware and 3D diagram. However, changes must be made to the hardware. In this edition, the suggestions received from the mentor were taken into account and the necessary changes were made.