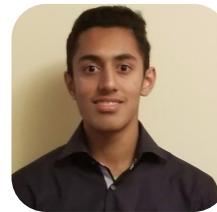


TRASH ‘N’ TRACK

RECYCLE RIGHT & CLOSING THE LOOP
TEAM 106C

TEAM IO6C



FATIMA JANGDA

HSHMAT SAHAK

JASMINE ZHANG

RITVIK SINGH

SOPHIE LEE

YAWAR ASHRAF

Engineering Design | Software | Electrical | CAD

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01.

INTRODUCTION

PLASTIC WASTE MANAGEMENT IN GHANA

95% of plastic waste is not recycled properly



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OUR GOAL

95% of plastic waste is not recycled properly



Increase collection of waste by focusing on the point of collection.

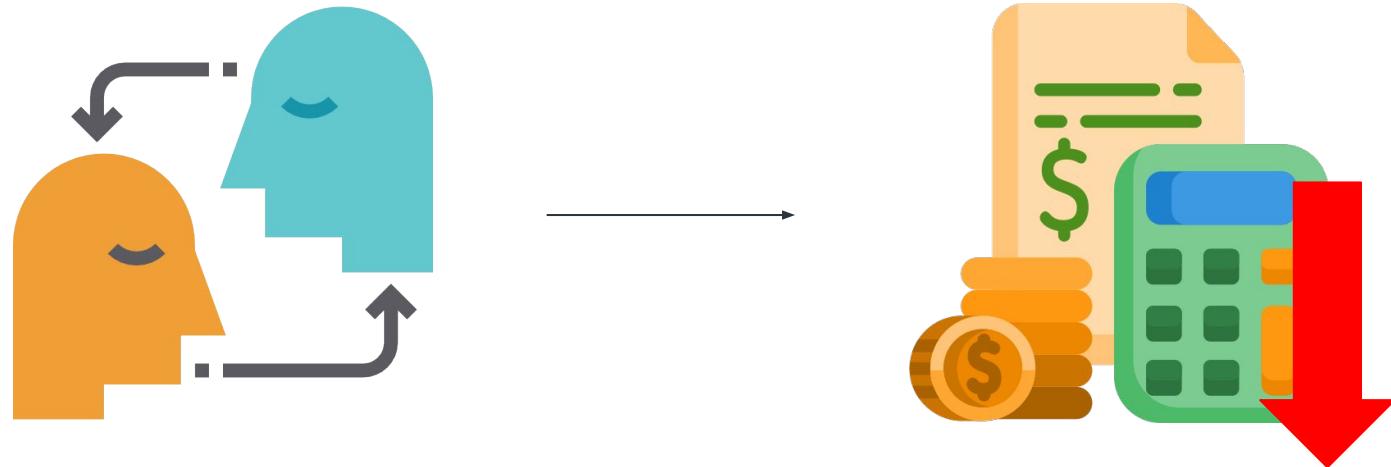
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OUR VALUE



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3 PROBLEMS

1. Overflow of garbage
2. Recyclables not effectively diverted to recycling facilities due to inefficient waste collector routines
3. Limited financial resources



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OUR SOLUTION: TRASH 'N' TRACK

Modular system that notifies waste collection authorities of the locations of full bins



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HOW OUR SOLUTION SOLVES THE 3 PROBLEMS

1. Overflow of garbage
2. Recyclables not effectively diverted to recycling facilities due to inefficient waste collector routines
3. Limited financial resources

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VALUE PROPOSITION

1. Overflow of garbage
 2. Recyclables not effectively diverted to recycling facilities due to inefficient waste collector routines
 3. Limited financial resources
-
1. Senses when waste is overflowing

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VALUE PROPOSITION

- 1. Overflow of garbage
 - 2. Recyclables not effectively diverted to recycling facilities due to inefficient waste collector routines
 - 3. Limited financial resources
-
- 1. Senses when waste is overflowing
 - 2. Provides real-time “fullness” and location data to help waste collectors

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VALUE PROPOSITION

- 1. Overflow of garbage
 - 2. Recyclables not effectively diverted to recycling facilities due to inefficient waste collector routines
 - 3. Limited financial resources
-
- 1. Senses when waste is overflowing
 - 2. Provides real-time “fullness” and location data to help waste collectors
 - 3. Is cost effective and uses existing waste infrastructure

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UN SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH
AND WELL-BEING



11 SUSTAINABLE CITIES
AND COMMUNITIES



12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



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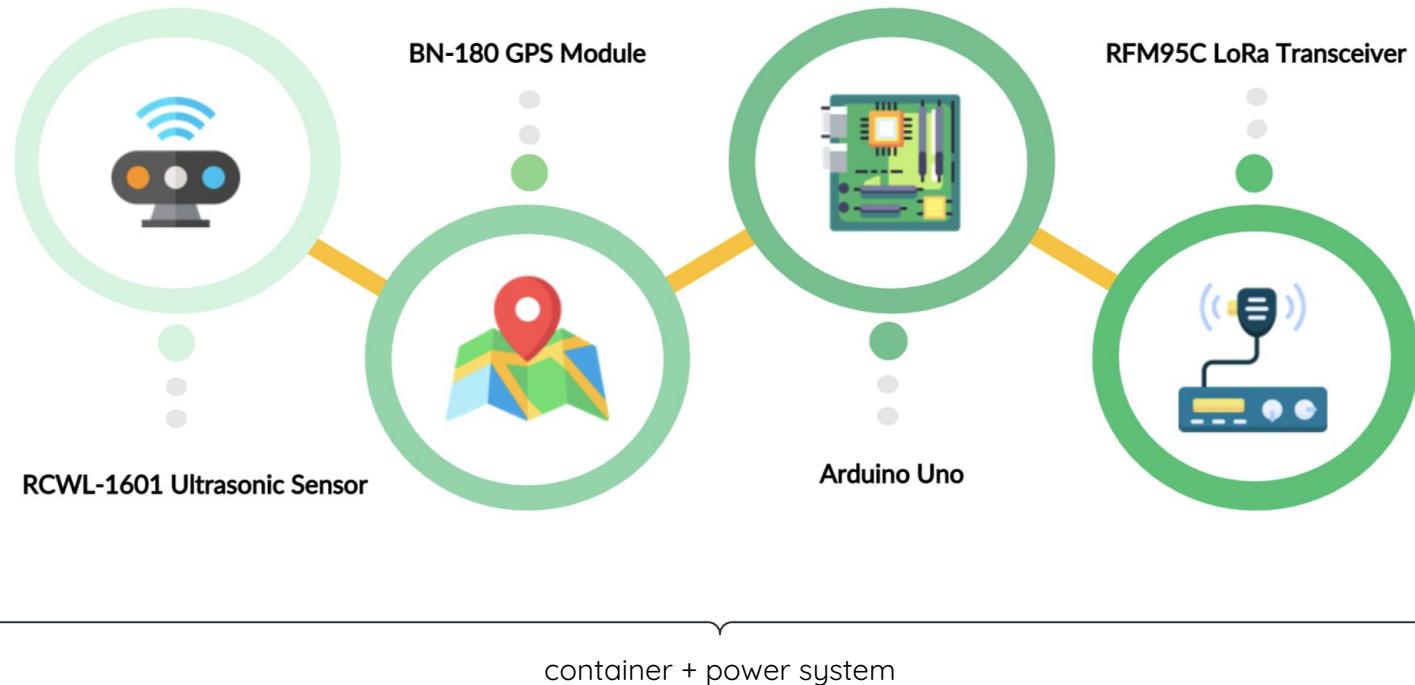
02.

DESIGN & PROTOTYPE

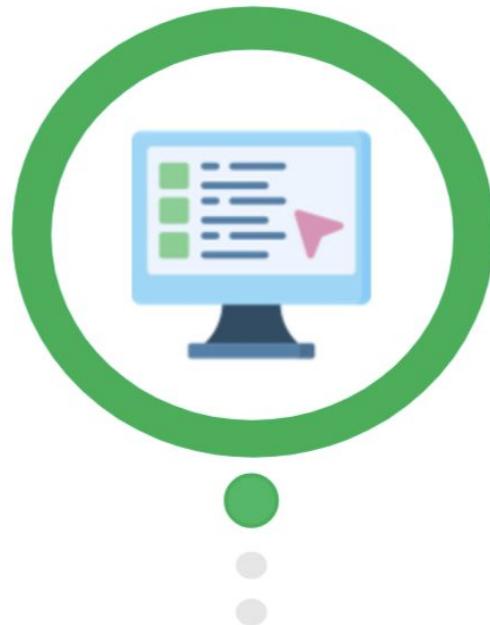
FUNCTION OF DESIGN



FUNCTION OF DESIGN - PHYSICAL SYSTEM



FUNCTION OF DESIGN - VIRTUAL PLATFORM



Web-App

FUNCTION OF PROTOTYPE

Demonstrates:

- Sensor: detects distance
- GPS: provides real-time location
- Arduino and Bluetooth Module:
connects sensor & GPS to app
- React app: shows the location of full trash cans
- Case: encloses and locks all parts
- Battery system: powers the components

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FUNCTION OF PROTOTYPE



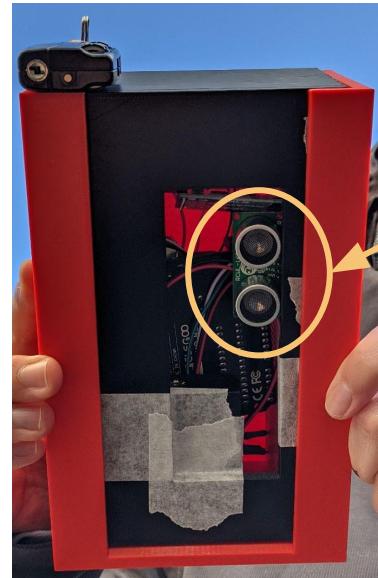
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FUNCTION OF PROTOTYPE



RCML-1601 Ultrasonic
Sensor

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PROTOTYPE DEMO

Trash n Track

Set Up Bin Log Out

Trash Can Details
Bin 1
Last Friday at 8:03 PM

Trash Can Details
Bin 2
Last Friday at 7:25 PM

Trash Can Details
Bin 3
Last Friday at 8:30 PM

Trash n Track

Set Up Bin Log Out

Bin - 2
Rarely collected.

Set up on November 26th 2021, 7:25:23 pm
Location coordinates - 7.9465° N, 1.0232° W

BIN FULL - Needs to be picked up

PROTOTYPE DEMO

The image shows a dual-monitor setup. The left monitor displays a web application with three sections: 'Trash Can Details' for 'Bin 1' (11/09/2020), 'Bin 2' (11/09/2020), and 'Bin 3' (11/09/2020). The right monitor shows a code editor with a file named 'main.js'. The code contains logic for reading messages from a database, calculating distances between bins, and sending notifications via a messaging service.

```
data = message.read_message();
if(data != null) {
    console.log("Data received");
    let distance = data["distance"];
    let lat1 = data["lat1"];
    let lon1 = data["lon1"];
    let lat2 = data["lat2"];
    let lon2 = data["lon2"];
    let message = data["message"];
    let recipient = data["recipient"];
    let timestamp = data["timestamp"];
    let title = "Bin Alert";
    let body = "Your bins are full!";
    let notification = "Your bins are full! Please empty them as soon as possible.";
    let notification_type = "bin_alert";
    let notification_id = "bin_alert_" + timestamp;
    let notification_message = "Your bins are full! Please empty them as soon as possible.";
```

```
let dbRef = db.collection('bins').document(`${
        timestamp
    }`);
dbRef.set({
    distance,
    lat1,
    lon1,
    lat2,
    lon2,
    message,
    recipient,
    timestamp,
    title,
    body,
    notification,
    notification_type,
    notification_id,
    notification_message
});
```

```
for(let i = 0; i < distance; i++) {
    let distance = 10.0;
    let lat1 = 40.6892;
    let lon1 = -74.3997;
    let lat2 = 40.6892;
    let lon2 = -74.3997;
    let message = "Bin Alert";
    let recipient = "1234567890";
    let timestamp = "2020-11-09T12:00:00Z";
    let notification = "Your bins are full!";
    let notification_type = "bin_alert";
    let notification_id = "bin_alert_" + timestamp;
    let notification_message = "Your bins are full! Please empty them as soon as possible.";
```

```
try {
    const response = await fetch(`https://fcm.googleapis.com/v1/projects/${process.env.FCM_PROJECT_ID}/messages:send`, {
        method: "POST",
        headers: {
            "Content-Type": "application/json",
            "Authorization": `key=${process.env.FCM_API_KEY}`
        },
        body: JSON.stringify({
            message: {
                notification: {
                    title: message,
                    body: notification,
                    click_action: `https://${process.env.HOSTNAME}/#/binAlert?${notification_id}`,
                    sound: "default"
                },
                token: recipient
            }
        })
    });
}
```



03.

DESIGN HIGHLIGHTS

I: KEY DESIGN DECISION

- Arduino Uno

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II: KEY DESIGN DECISION

- Use of LoRa Transceiver

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04.

CONCLUSION

LIMITATIONS

- Non-compatible with fully metal trash cans
- Works with communal bins only
- Red portion of case permanently attaches to bin
- Maintenance required



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ASSUMPTIONS

- Communal bins are sufficiently large
- Waste collectors are willing and able use this new technology

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NEXT STEPS

- Explore different case attachment mechanisms
- Explore materials (cost, durability)
- Determine optimal distance threshold
- Address limitations of GPS
- Ensure safety of internal circuitry

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THANKS!

Do you have any questions?

