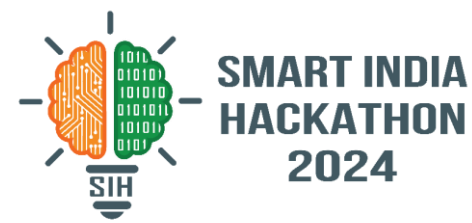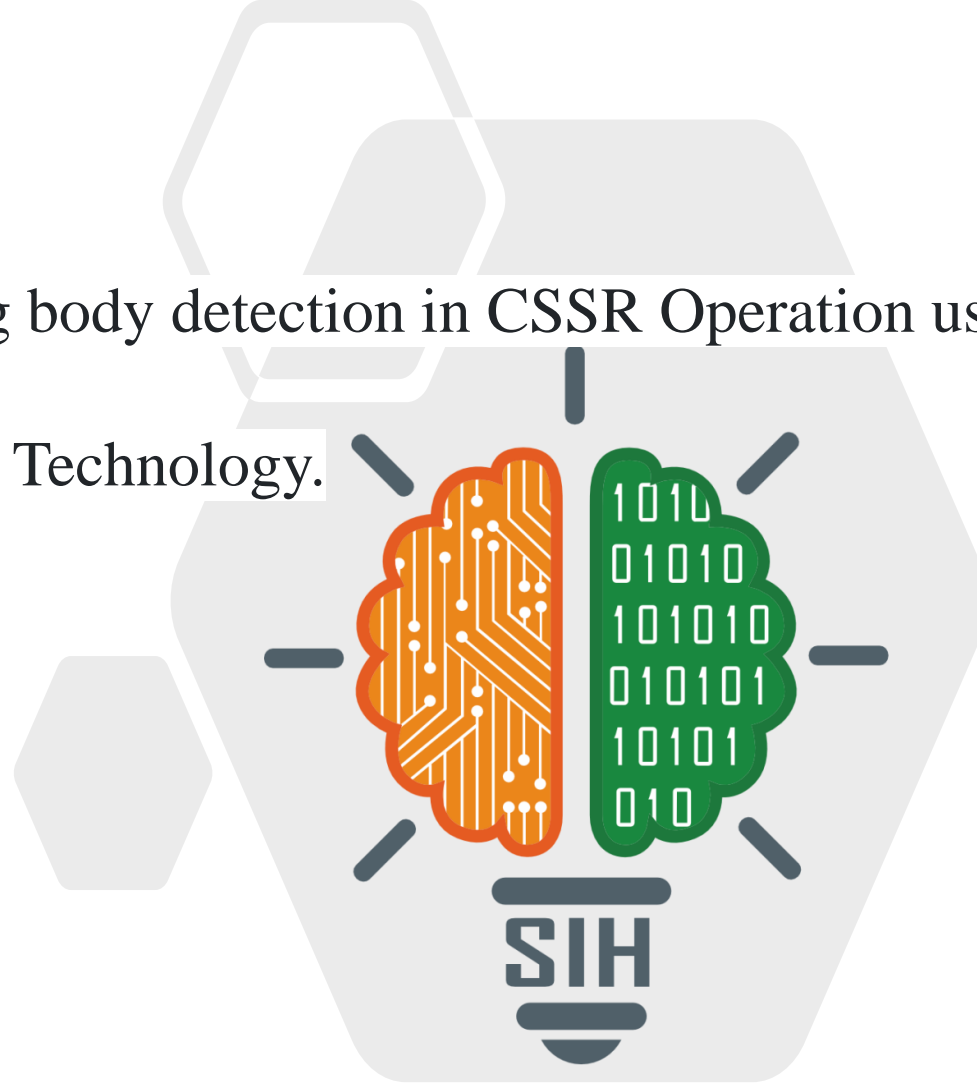# SMART INDIA HACKATHON 2024

- **Problem Statement ID -** SIH1566

- **Problem Statement Title -** Enhancing body detection in CSSR Operation using Advanced Technology.

- **Theme -** Disaster Management

- **PS Category -** Hardware

- **Team ID -** 18514

- **Team Name -** TECH_PIRATES1

COLLAPSED STRUCTURE SEARCH AND RESCUE

SMART INDIA HACKATHON 2024

IDEA / SOLUTION

Empowering search and rescue operations under collapsed structure with advanced technology (sensor) and NDRF expertise .

- Deploying, Aluminum rod equipped with sensors that can sense the victims and maneuvered into tight spaces within the debris.

- These rods will be equipped with various sensors and integrated with **LCD display** to provide real-time data to the NDRF team.

PROBLEM RESOLUTION

- The rescue team carries rod equipped by sensors (device) with them to assist in navigating and rescuing the victims from debris (similar to an bomb detector).

- The device also have a battery back-up to power the sensors.

- This module can be infused in drones to ensure the safety of NDRF team in non-humanized area .

UNIQUE VALUE PROPOSITIONS (UVP)

- **Data Collection:** The sensors continuously collect and transmit data back to the LCD (16 X 2) grove lcd display.
- **Analysis:** The display indicates potential victim locations based on sensor readings instantly .
- **Rescue Coordination:** Rescue teams use the information to prioritize and direct their efforts, ensuring a swift response.

TECHNICAL APPROACH

HARDWARE

- **Microcontroller :** Arduino Uno

- **Sensors :**
  - Millimetre-Wave Radar Sensor (**S3KM1110**)
  - UWB (Ultra-Wideband) Sensor (optional)
  - Microwave Radar Sensor (**RCWL-0516**) (used in the prototype video)

- **Screen :** 16 x 2 GROVE RGB – LCD screen

- **Drones :** Equipped with similar sensors to extend the search range and provide aerial data

- **Power :** Rechargeable Batteries: Lithium-ion power Bank

WORKFLOW

PROJECT PROTOTYPE LINK : https://youtu.be/R7HqtAe58Ow?si=eemePIIQON2JDnyj
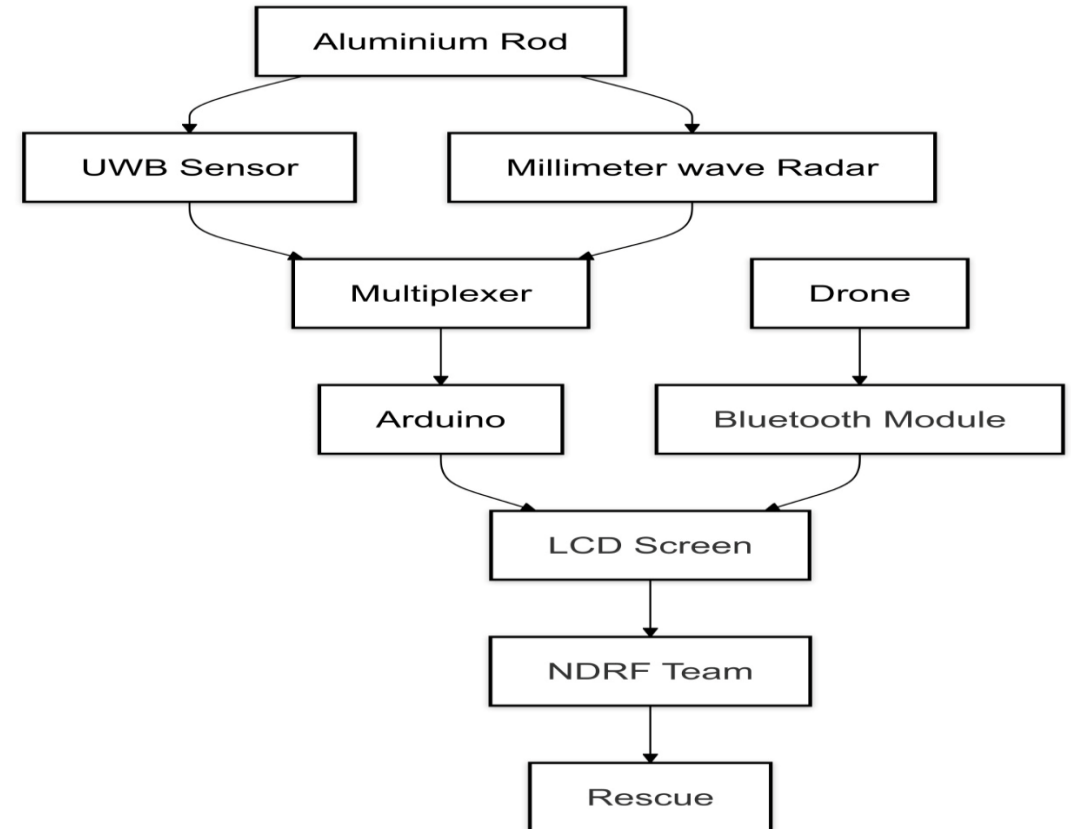
FEASIBILITY AND VIABILITY
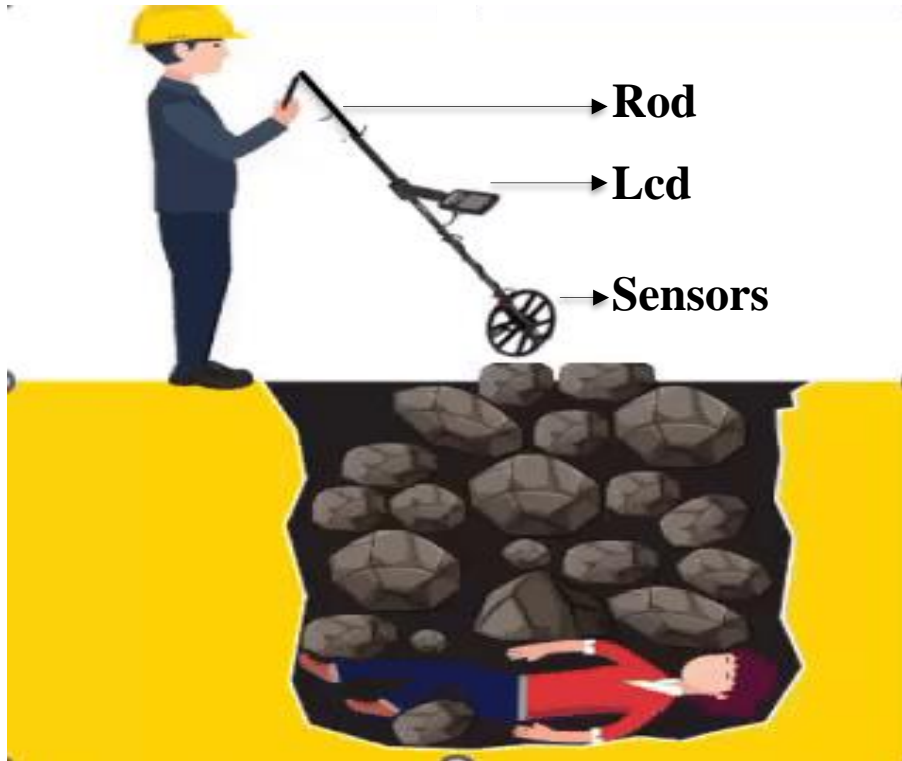
FEASIBILITY ANALYSIS

- **Sensor Integration** : Using a multiplexer to integrate sensors and simplify the connections to the microcontroller.
- **Power Management** : Ensuring to have power supply in reliable and portable form (considering rechargeable batteries or power banks).
- **Cost Estimation (Single Device)**
  - UWB Sensor (10 meter depth)- 6,200
  - Arduino - 1,500
  - Millimeter-Wave Radar(5Mtr)- 3,000
  - LCD screen 16 x 2 - 600
  - Power Bank with adapter - 2,000

  Total cost Rs | **13,300**

VIABILITY ANALYSIS

- **Screening Method and Display :** The processed data can be directly displayed on an LCD attached with hand node (rod).

- **Display Information:** Detect survivors, include visual cues (e.g., green for no detection, red for detected victim) for quick identification.

- **Compact and Easy-to-Carry Design :** The rod should be lightweight, foldable and made of durable materials (like carbon fiber or aluminum).

- **Use of Drones :** Mounting similar sensors on drones to scan and rescue .

IMPACTS AND BENEFITS

ANIMATED VIDEO

Rod

Lcd

Sensors

BENEFITS

Rapid Detection

Reduced Search Time

Comprehensive Coverage

increased accuracy in locating victims

Data Fusion

improved safety for the rescue team.

Remote Monitoring

Enhanced decision-making capability

RESEARCH AND REFERENCES

PROCESS CONCLUSION

- So, by using the mm-wave sensors and radars the victims can be easily rescued from the collapsed structure with the help of this device(consist of sensors) present in the given solution .

- The drones are been used in the place where the human cannot move into and search the victims in this case the drones are equipped with the sensors to avoid life threat to the NDRF team .

- Victim will be rescued successfully .

SITE REFERENCES

- Disaster awareness website (Click here)

- UWB sensor radar ref (Click here)

- mm-wave radar ref (Click here)

- IEEE paper ref (Click here)

VIDEO REFERENCES

- Project-explanation link (Click here)

- Sensor-working link (Click here)