SMART INDIA HACKATHON 2024

TITLE PAGE

- **Problem Statement ID- SIH1531**

- **Problem Statement Title- Tackling waste management issues at tourist destinations**

- **Theme-Travel & Tourism**

- **PS Category-Hardware**

- **Team ID-4648**

- **Team Name- NAVYANTRAS**

IDEA TITLE

IDEA / SOLUTION :

The smart waste bin uses sensors for monitoring waste, enabling automated cleaner allocation and efficient cleaning. QR codes promote sustainability and boost revenue, ultimately contributing to environmental benefits our project.

- **Sensor-Based Waste Monitoring:** Smart trash bin uses industrial IR and ultrasonic sensors to detect full bins, ensuring timely waste management and preventing overflow.
- **Automated Cleaner Allocation**: Automatically assigns cleaners based on bin status, improving cleaning efficiency and optimizing schedules.
- **Precise Lid Operation:** Servo motor with PIR sensors opens the bin's lid for contactless, hygienic waste disposal, enhancing cleanliness.
- **Environmental Impact:** Cleaning public spaces keeps them unpolluted, preserves landscapes, reduces disease risk and promotes a healthier environment.
- **Reward System:** A QR code on the bin lid allows users to collect points for rewards, redeemable at local stores in area.

Problem Resolution :

- **LoRa** is used for **communication** between **slave units and a smart bin** without relying on the internet.
- Advanced **GSM 4G LTE** with SIM ensures reliable data transfer from a smart bin to Central hub **without Wi-Fi**.
- The front **lid** and **large door prevent rainwater** ingress while facilitating **easy waste disposal**.
- A **subscription model** for regular **hardware** and **software** monitoring reduces high maintenance costs and prevents issues.

Unique Value Propositions (UVP) :

- **Boosts Store Revenue:** QR codes increase customer visits to nearby stores.
- **Business Model:** Subscription service ensures continuous maintenance and revenue generation.
- **Autonomous Connectivity:** GSM with SIM card ensures data transfer without Wi-Fi.

TECHNICAL APPROACH

Detection System: The intelligent dustbin system uses industrial IR and ultrasonic sensors to detect the bin level. A servo motor opens the lid automatically, ensuring hygiene.
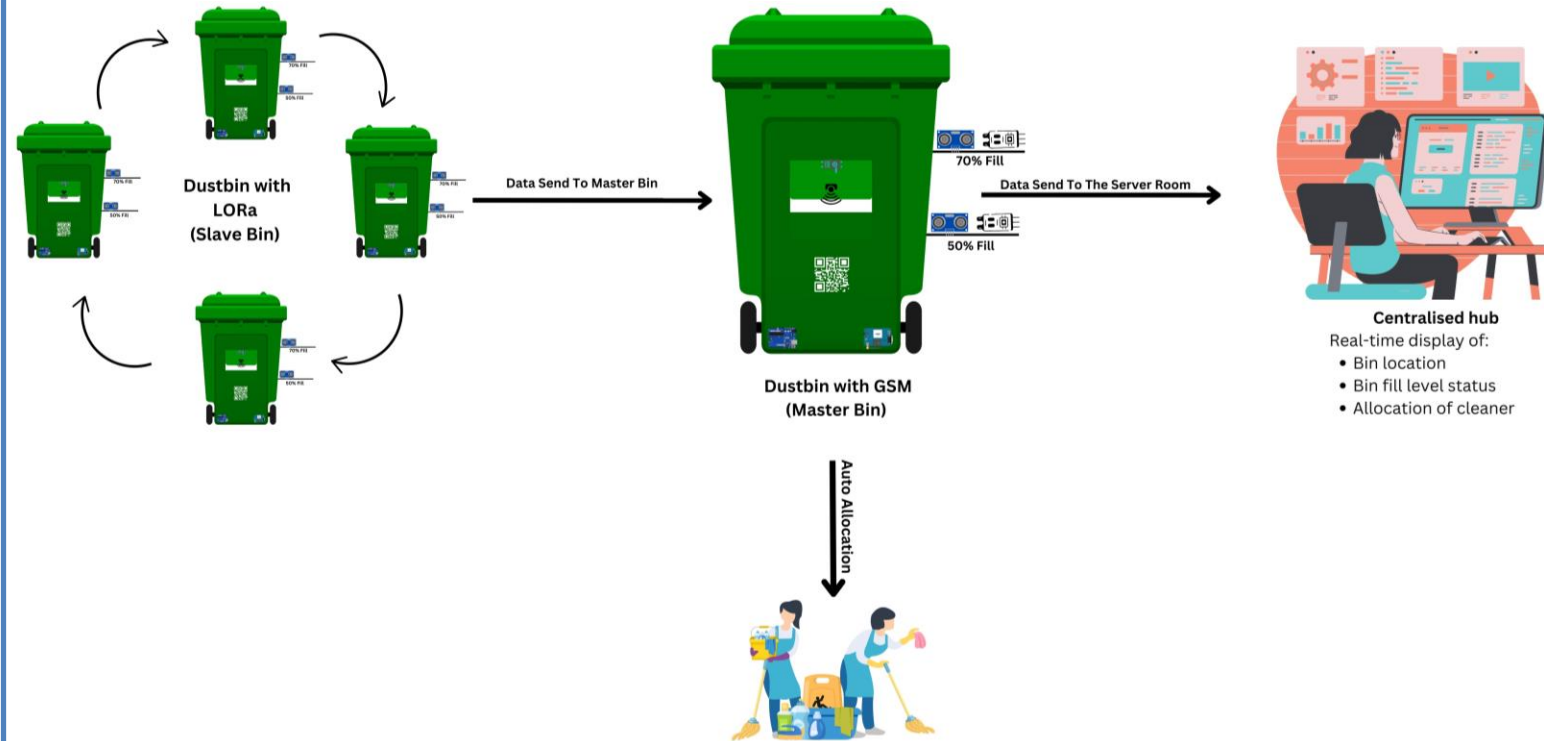
User Design: An additional top door allows easy disposal of larger waste. Microcontroller effectively drives the system and commands the sensors.

Data Transfer: Data transfers to a centralized hub using GSM and ESP modules. This system automatically allocates cleaning duties to cleaners when necessary.

User Rewards: A QR code on the dustbin lid rewards users for proper waste disposal. Scanning earns points redeemable at local stores nearby.

Business Model: A subscription model will maintain software integrity and updates for customers. Hardware maintenance subscriptions monitor performance, enhancing the overall business model.

PROCESS FLOW ARCHITECTURE

Dustbin with LORa (Slave Bin)

Data Send To Master Bin

70% Fill
50% Fill

Dustbin with GSM (Master Bin)

Data Send To The Server Room

Auto Allocation

Centralised hub
Real-time display of:
• Bin location
• Bin fill level status
• Allocation of cleaner

Product Status: 60% product built completed and further build is on progress. Testing and validation process are next to be undergone.

FEASIBILITY AND VIABILITY

- ## Analysis of the feasibility of the idea
  Technical, Financial, Market, Operational

- ## Potential challenges and risks
  Sensor Malfunction, Connectivity Issues, Weather Damage, Data Security, Maintenance Costs

- ## Strategies for overcoming these challenges
  Waterproof Design, GSM Module, industrial Sensors

IMPACT AND BENEFITS

- Potential impact on the target audience

  Enhanced Hygiene ,Reliable Operations, Increased Revenue

- Benefits of the solution (social, economic, environmental, etc.)

  Enhanced Hygiene, Increased Community Engagement
  Economic-Revenue Growth, Cost Efficiency, Market Expansion
  Environmental- Reduced Waste, Lower Pollution

- Details / Links of the reference and research work
  1) https://transmitter.ieee.org/makerproject/view/8c49a
  2) https://www.researchgate.net/publication/365420981_Design_and_Development_of_Smart_Waste_Bin_for_Effective_Waste_Collection_and_Managemen
  3) https://ai.thestempedia.com/project/diy-smart-trash-bin/