SmartCityX: The AIoT Hackathon

Prototype Phase REPORT

Project name: 13. Street light – 2D - Infra
Team name: Hybrid-ECE&CS

Team Lead:

1. A R Abhinavendra – CB.EN.U4ECE24002-ECE 2nd year

Team Members:

1. Shashaank M K-CB.SC.U4CSE24048-CSE 2nd year
2. Kabilan O-CB.EN.U4ECE24024-ECE 2nd year
3. Tharun D-CB.SC.U4CSE24053-CSE 2nd year

Theme: Urban Infrastructure
Track: 2D Model

Idea Brief:

This project aims to provide a simple and efficient solution for street lights. It uses Esp-cam to collect image of the street view and uses **binary classification or anomaly detection** ML algorithm to **sense humans/vehicles ONLY**. Initially all the street lights remain at 20% intensity, when a human/vehicle is detected then the light which sensed it will be set to 100% intensity. Say the light is termed **'N' then N+-1 will be set to intensity 80%**, N+-2 will be set to 60% and so on. It uses PWM for dimming lights. It will additionally count the litter within its radius and send the information to cloud.

Software Requirements:

This project uses an ESP32-CAM mounted on a streetlight to detect humans, vehicles, and street dogs using a lightweight FOMO model trained on Edge Impulse. When motion is detected, the streetlight is automatically turned on, and status data is sent to the Blynk cloud for real-time monitoring. A MERN-based website and Blynk mobile app provide control and visualization. The system is optimized for low power and edge deployment, with optional future integration of AR to simulate detection zones in the environment.

Website Tech Stack: MERN - React.js

App Tech Stack: MIT App Inventor or Flutter

AI/ML model: Edge Impulse FOMO

Dataset:
https://www.kaggle.com/datasets/luiscrmartins/surveillance-images-for-person-detection/data
https://www.kaggle.com/datasets/pkdarabi/vehicle-detection-image-dataset

Wokwi link: https://wokwi.com/projects/437353533864003585
Cloud Platform: Blynk

Feasibility:

Many parts of India still have underdeveloped public infrastructure and facilities. One the most common looked upon facilities are the street lights. These provide the most safety during the night time or dark/shady areas. Binary classification is used to detect humans/vehicles and it is one of the most RAM efficient ML algorithms. MobileNet TFLM is used for this purpose. It also additionally has a LDR sensor to turn on the lights, it even gets turned ON when it is around afternoon with cloudy weather.

By dimming:

- Electrical stress on the components reduces.
- Operating temperature decreases, especially for LEDs and halogens.
- Slower lumen depreciation (brightness loss over time).
- Extended operational life of the bulb.
- Additional Human/Vehicle detection system.
- Only Humans and Vehicles will be detected which makes it better than existing smart street lights which only use IR sensor and can also falsely detect street dogs, tin cans, etc

Waste detection:

- The system will be trained with detecting different litter objects which will count the litter and send the information to Blynk- a cloud platform.
- Authorities will know where there is usually more waste, so they can take necessary measures.

Budget:

S. No.	Name	Count	Purchase link/Offline-store	Status	Price
1	ESP CABLE - PANNA 3.4A	1	Majestronicz Coimbatore (Offline)	Purchased	58
2	INSULATION TAPE	1	Majestronicz Coimbatore (Offline)	Purchased	10
3	ESP32 WROOM - WIFI MODULE (38 PIN)	1	Majestronicz Coimbatore (Offline)	Purchased	390
4	3.7 V LITHIUM ION BATTERY 2500MAH	1	Majestronicz Coimbatore (Offline)	Purchased	75
5	LM393 - LDR SENSOR MODULE	1	Majestronicz Coimbatore (Offline)	Purchased	30
6	ESP32 CAMERA - OV2640 (only cap)	1	Majestronicz Coimbatore (Offline)	Purchased	765
7	LED - GREEN	1	Majestronicz Coimbatore (Offline)	Purchased	1
8	LED - RED	1	Majestronicz Coimbatore (Offline)	Purchased	1
9	LED - YELLOW	1	Majestronicz Coimbatore (Offline)	Purchased	1
10	MT3608 Booster Module	1	Majestronicz Coimbatore (Offline)	Purchased	35
11	TP4056 Charging Module	1	Majestronicz Coimbatore (Offline)	Purchased	15
12	switch	2	Majestronicz Coimbatore (Offline)	Purchased	10
13	Resistors-220 ohm	3	Majestronicz Coimbatore (Offline)	Purchased	3

14	Connecting wires	As required	Majestronicz Coimbatore (Offline)	Purchased	20
				Total	1,414