

**SMART BIDIRECTIONAL VISITOR COUNTER WITH
ADVANCED MONITORING AND CONTROL FEATURES
EC6020-EMBEDDED SYSTEMS AND DESIGN**



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INTRODUCTION: -

The Bidirectional Visitor Counter with Advanced Monitoring and Control is a smart and AI-driven system designed to track and manage visitor movement efficiently. This system uses sensors and cameras with machine learning algorithms to differentiate humans from objects and integrates IoT technologies for mobile app control and real-time alerts.

WHY WE SELECT THIS PROJECT:

PROBLEM: -

Traditional or ordinary visitor counters are frequently imprecise. Because they are unable to discriminate between people and objects most of the times. This results in inadequate monitoring and faulty data collecting.

And lack smart features like integration with lighting control, historical data storage, and remote management via mobile applications.

Organizations also face challenges in managing crowd limits, ensuring energy efficiency, and analyzing visitor trends effectively.

The high cost of advanced visitor counters is a significant barrier for many businesses and institutions in Sri Lanka.

SOLUTION: -

- Using advanced sensors and a camera integrated with machine learning to detect and count only humans.
- Automatically turning on lights when a person enters and turning them off when no one is inside, ensuring energy efficiency.
- Allowing users to set an entry limit via a mobile app and sending alerts when the limit is exceeded.
- Displaying real-time visitor counts on an LED screen.
- Storing visitor history for later analysis.
- Predicting visitor behaviors such as walking, running, or standing.
- Plan to design it to bridge the gap in the market by offering a high-quality, feature-rich solution at an affordable price point.

NOVELTY: -

1. Human Detection with ML:

- A camera integrated with an AI model ensures only humans are counted, eliminating errors caused by objects or animals.

2. Mobile App Integration:

- Real-time visitor count display.
- Set and monitor occupancy limits.
- View historical logs and receive alerts.

3. Energy Efficiency:

- Intelligent light control saves energy by ensuring lights remain off when the space is unoccupied.

4. Alert Mechanism:

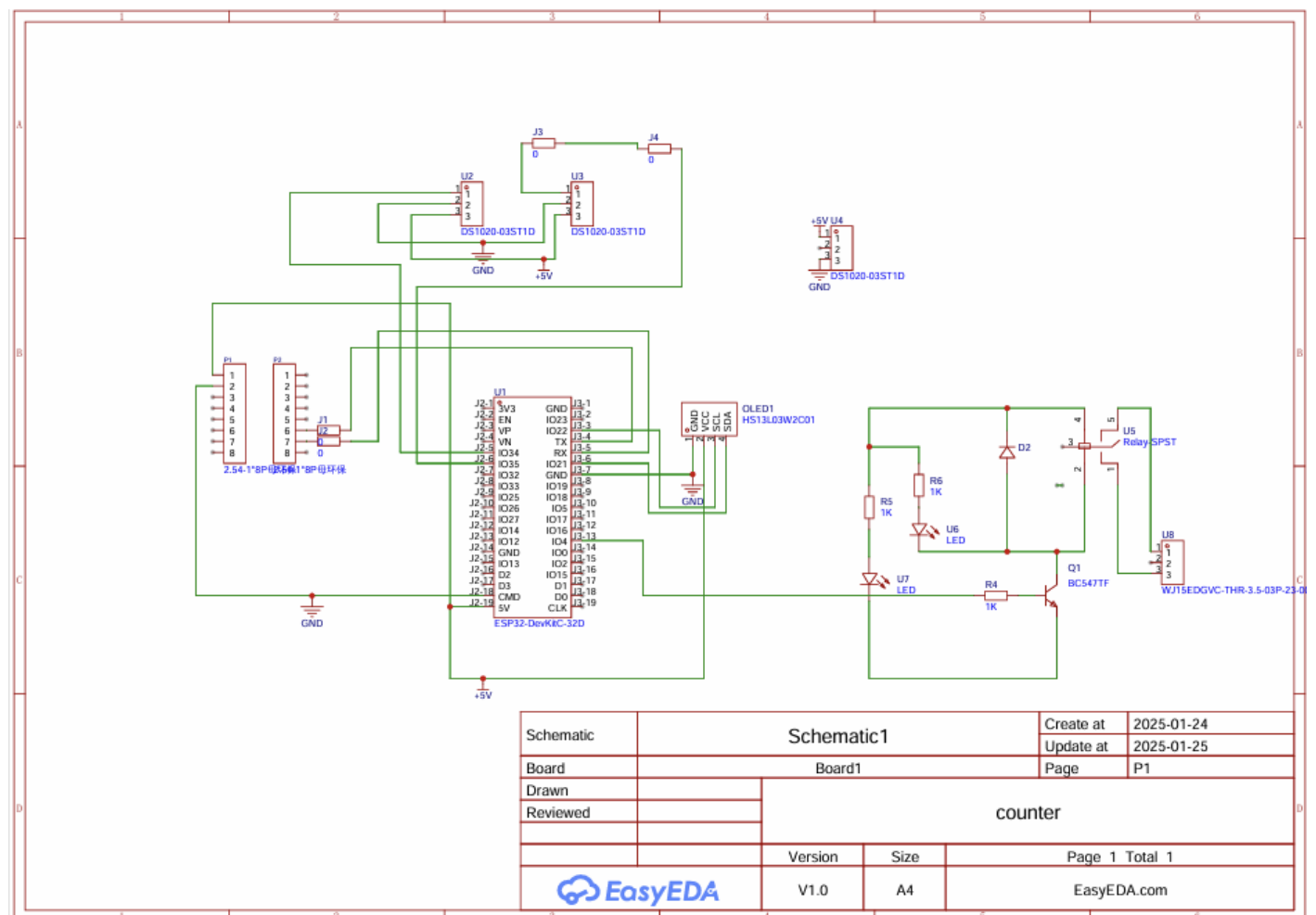
- Alerts for exceeding crowd limits improve safety in crowded environments.

HIGH-LEVEL ARCHITECTURE: -

TECHNOLOGIES AND WHY WE CHOOSE: -

- **Sensors and Cameras:** Detect incoming and outgoing visitors and identify humans using ML algorithms.
 - PIR Sensor: Detects motion for quick response.
 - Ultrasonic Sensors: Tracks bidirectional entry and exit.
 - Camera Module (ESP32-CAM): Captures images for ML-based human detection.
- **Machine Learning Models:** Ensures reliability by differentiating humans from objects.
- **IoT Connectivity:** Enable app control for setting limits, accessing history, and managing alerts.
- **Mobile Application:** Provides remote control, alerts, and analytics tools.
- **Cloud Storage:** Stores historical data securely and allows access from anywhere.

CIRCUIT DESIGN AND PROTOCOLS:



GITHUB REPO LINK: -

https://github.com/Gowsalya200227/Visitor_Counter-.git

BUDJET:

No.	components	quantity	Price(LKR)
01.	Esp32	01	1300.00
02.	Esp32 cam	01	2500.00
03.	IR sensor	02	500.00
04.	Relay	01	100.00
05.	Oled display	01	850.00
06.	Transistors	01	10.00
07.	Resisters and led		40.00
08.	connectors		40.00
09.	Jumper wires		80.00
	Total		5420.00

These are the approximate values. May be real output will be in 5000.00 to 7000 range.

In market There are,

1. advanced visitor counters price in Sri Lanka are within LKR20 000 to LKR45 000
 2. entry-level device, designed for simple counting tasks, is priced at approximately LKR 698. (but this not have advanced features it just only count.)
- ❖ Our proposed Bidirectional Visitor Counter with Advanced Monitoring and Control, aims to address this issue by offering a comprehensive solution within a budget of LKR 10 000. This cost-effective approach makes advanced visitor management accessible to a broader range of businesses and institutions, promoting efficient operations and energy savings without the financial burden associated with current market offerings.

TIME LINE:

IN 2025,

[illegible]

Target Market for the Bidirectional Visitor Counter:

01.	Shopping malls, office buildings, co-working spaces, and retail outlets.	<ul style="list-style-type: none"> ✓ Crowd management by monitoring occupancy in real-time. ✓ Reduces energy costs through automated lighting control. ✓ Provides analytics to improve operations, like peak hour monitoring.
02.	Schools, colleges, libraries, and auditoriums.	<ul style="list-style-type: none"> ✓ Enhances student and staff safety by keeping track of room occupancy. ✓ Automates energy-saving measures in large campuses with multiple rooms. ✓ Helps administrators analyze visitor trends for better space utilization.
03.	Hotels, restaurants, and event venues.	<ul style="list-style-type: none"> ✓ Ensures guest comfort by maintaining optimal lighting and occupancy monitoring. ✓ Adds a modern, smart technology appeal to attract tech-savvy customers.
04.	Hospitals, clinics, and wellness centers.	<ul style="list-style-type: none"> ✓ Tracks patient and visitor numbers to ensure safety and prevent overcrowding. ✓ Reduces energy consumption in rooms when unoccupied. ✓ Helps maintain compliance with patient care standards and safety protocols.
05.	Apartments, smart homes, gated communities.	<ul style="list-style-type: none"> ✓ Offers a convenient and efficient way to manage household lighting based on presence. ✓ Provides added security by detecting and alerting unusual activity. ✓ Enhances the smart home experience with app-controlled monitoring.
06.	Museums, libraries, government offices, and parks.	<ul style="list-style-type: none"> ✓ Ensures crowd control and compliance with capacity restrictions. ✓ Provides real-time data for operational improvements and public safety. ✓ Reduces operational costs by automating lighting systems.
07.	Warehouses, factories, and production facilities.	<ul style="list-style-type: none"> ✓ Monitors the movement of workers for safety and productivity analysis. ✓ Ensures lights and machinery are turned off in unoccupied zones, saving energy. ✓ Supports compliance with workplace safety and labor regulations.
08.	community halls.	<ul style="list-style-type: none"> ✓ Tracks visitor numbers during events and ceremonies to manage crowd control. ✓ Provides historical data for planning future events.

		✓ Automates lighting control for energy conservation.
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CONCLUTION:

Our proposed Bidirectional Visitor Counter with Advanced Monitoring and Control Features is an innovative and efficient solution for managing visitor flow, conserving energy, and enhancing safety. By leveraging machine learning, IoT, and mobile app technologies, the system ensures accuracy, usability, and scalability for various environments.

This project addresses current limitations and provides a smart, future-ready solution for effective visitor management.