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BIDIRECTIONAL VISITOR COUNTER

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Abstract: The Bidirectional Visitor Counter System is an innovative solution for accurately tracking the number of visitors entering and exiting a premises. Utilizing advanced sensors and algorithms, this system provides real-time data on visitor traffic, enabling businesses and organizations to optimize their operations, improve customer experience, and enhance security. The system's bidirectional capability ensures accurate counting in both directions, eliminating errors and providing reliable data. With its user-friendly interface and remote monitoring capabilities, this system is ideal for various applications, including retail, hospitality, and public venues. By providing actionable insights into visitor behavior, the Bidirectional Visitor Counter System helps organizations make data-driven decisions to drive growth and success.

Keywords: Bidirectional Visitor Counter, Visitors, Entry, Exit, IR sensor, Arduino, LED, OLED

I. INTRODUCTION

In today's world, managing the flow of people in various environments, such as public buildings, commercial spaces, and event venues, has become increasingly important. This is particularly crucial for ensuring safety, optimizing space utilization, and enhancing the overall experience of visitors. One effective solution to achieve these goals is the implementation of a bidirectional visitor counter.

A bidirectional visitor counter is a system designed to accurately count the number of people entering and exiting a specific area. Unlike traditional unidirectional counters that only track movement in one direction, bidirectional counters can differentiate between entry and exit, providing a real-time count of the current occupancy. This capability is essential for applications where knowing the exact number of people present at any given time is critical, such as in libraries, museums, airports, shopping malls, and conference centers.

The core components of a bidirectional visitor counter typically include infrared (IR) sensors, a microcontroller, and a display unit. The IR sensors are strategically placed at entry and exit points to detect the movement of people. When a person passes through the entry sensor, the system increments the count, and when a person passes through the exit sensor, the system decrements the count. This data is then processed by a microcontroller, which updates the current occupancy count and displays it on an OLED screen or other types of displays.

One of the significant advantages of a bidirectional visitor counter is its ability to provide real-time data on occupancy levels. This information can be used to ensure compliance with safety regulations, such as fire codes that limit the number of people in a building. Additionally, it can help businesses and organizations optimize their operations by understanding peak usage times and making informed decisions about staffing and resource allocation.

The bidirectional visitor counter system can be further enhanced with additional features such as alerts and notifications. For instance, when the number of people exceeds a predefined limit, the system can trigger an alert, such as flashing LEDs or sending a notification to a building manager, indicating that the area is at full capacity. This proactive approach helps in preventing overcrowding and ensures a safe environment for all occupants.

II. LITERATURE REVIEW

The project uses IR sensors to detect people entering and leaving the room and monitors the electric appliances. An unique architecture for an automated light system is implemented in an economical manner. Fails to limit people when the room has its full capacity.[1]

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The Project uses a dht11 sensor, where voltage is applied to Arduino and according to program it processes the analog signal into digital signal and forms a particular voltage for a particular temperature. Bidirectional Visitor Counter, automated electrical devices controller along with humidity and temperature detector with security alarm is proposed and executed. An automatic door system with recognition would add to industrial automation as well as energy conservation.[2]

The design and implementation of simplified bidirectional visitor counter (BVC) for tracking the number of people entering and exiting specific areas or stores within a commercial centre. By leveraging Arduino technology, it introduces a refined and comprehensive approach beyond manual counting and simplistic designs. In complex environments with multiple entrances and exits close together, bidirectional counters may face challenges in distinguishing individual paths Accurately.[3]

Design of bidirectional visitor counter which will count the number of visitors entering or leaving a premise and controls the gate and other electronic components like light, etc. It explains how to use an Arduino circuit and the Arduino IDE to run a bidirectional visitor counter and a room light controller. If a large number of individuals enter at the same moment, the IR sensor will not detect it.[4]

The project proposes a model for a visitor counter based on interrupting an IR beam. The system architecture includes an IR beam source, bidirectional visitor counter, automatic room light controller, and Arduino as the master controller. The system successfully counts and displays the number of visitors entering and exiting a room using IR sensors and Arduino. It effectively controls room lighting based on visitor presence. The implementation demonstrates the practicality and efficiency of the bidirectional visitor counter with automatic room light control system. There are no specific failures mentioned in the document regarding the bidirectional visitor counter with automatic room light controller project.[5]

The Project involves using Node-MCU Arduino, ultrasonic sensors, and Wi-Fi for data transmission in a bidirectional visitor counter IoT system. Data is collected from multiple entrence gates, transmitted to a CPU, and analyzed using ThinkSpeak.com for accurate visitor counting. By connecting 2 sensors to Arduino, the system accurately counts people entering through gates and sends the data to ThinkSpeak.com for analysis. The results are displayed in graphs showing the relationship between time and the number of people entering. The main issues encountered were the increased temperature of the Node MCU Arduino and sensor, as well as slow server connection speeds.[6]

III. METHODOLOGY

The bidirectional visitor counter project involves the integration of hardware components, software development, and testing to create a system that accurately counts the number of people entering and exiting a specific area. The following sections outline the detailed methodology used in the implementation of the project:

1. Hardware Selection and Setup

Components:

- **Infrared (IR) Sensors:** Two IR sensors are used to detect the entry and exit of people. One sensor is placed at the entry point and the other at the exit point.
- **Microcontroller (Arduino):** An Arduino board is used to read the sensor data, process the information, and control the output devices.
- **OLED Display:** A small OLED display is used to show the current occupancy count and messages when the area is full.
- **LEDs:** Two LEDs are used to indicate entry and exit actions visually.

Setup:

- **Pin Configuration:** The IR sensors are connected to digital input pins on the Arduino, while the LEDs are connected to digital output pins.
- **Display Connection:** The OLED display is connected via the I2C interface to the Arduino for data communication.
- **Power Supply:** The entire setup is powered using a suitable power source, ensuring all components receive the required voltage.

2. Software Development

A code is developed based on the functions to be performed such as Counting the Entry and Exit of Visitors, Indicating with LEDs and Displaying on the OLED screen. Arduino IDE Software is used to run the code.

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3. Testing and Validation

- **Functional Testing:** The system is tested to ensure that it accurately counts entries and exits, updates the display correctly, and triggers the LEDs as expected.
- **Stress Testing:** The system is subjected to multiple entries and exits to verify that it handles rapid changes in occupancy without errors.
- **Boundary Testing:** Tests are conducted to ensure the system behaves correctly when the count reaches the maximum capacity and when the count is at the minimum (e.g., zero).

IV. PROPOSED SYSTEM

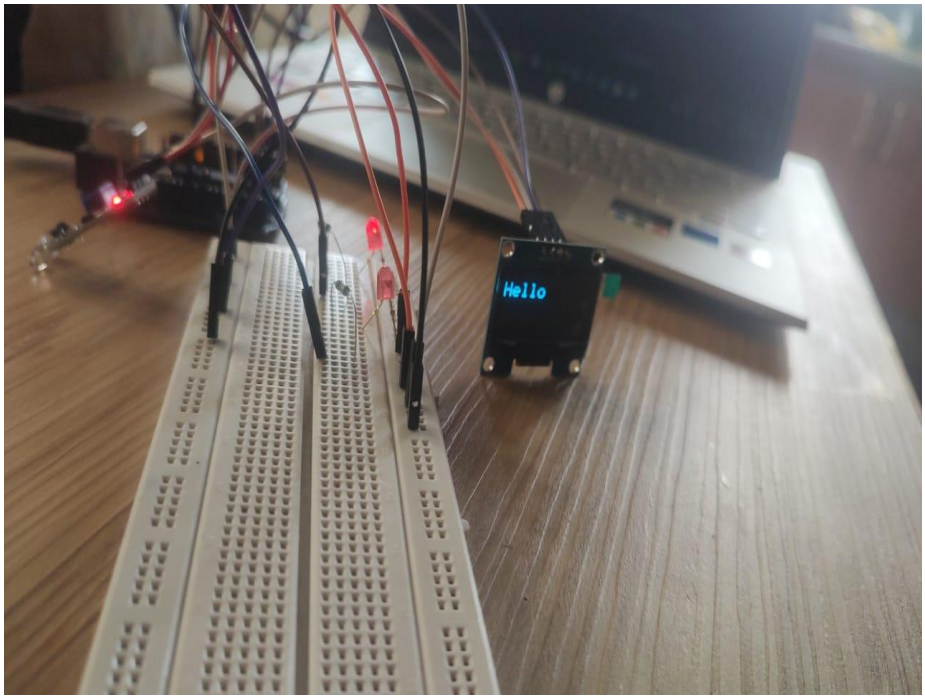

Fig. 1 Proposed Circuit Setup

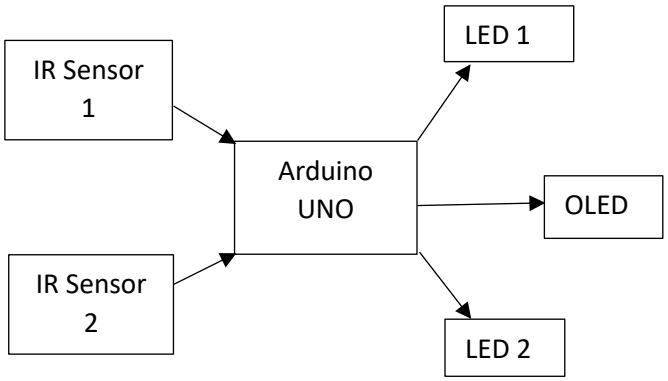

Fig. 2 Block Diagram

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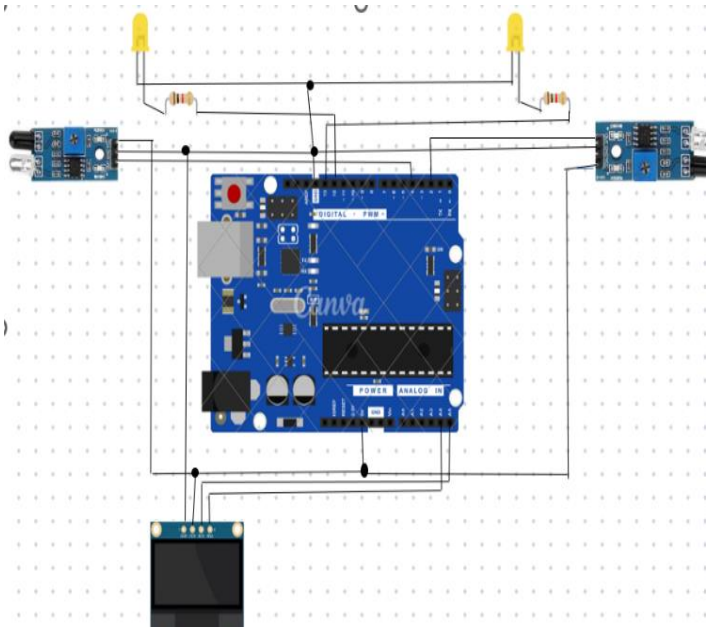

Fig. 3 Circuit Diagram

V. RESULTS

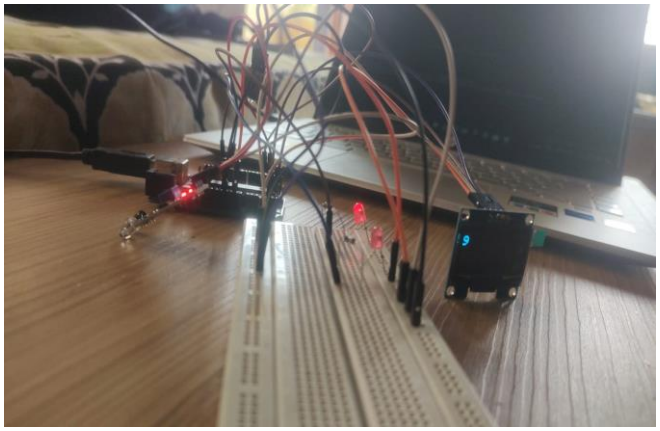

Fig. 4 Output shown in the Circuit

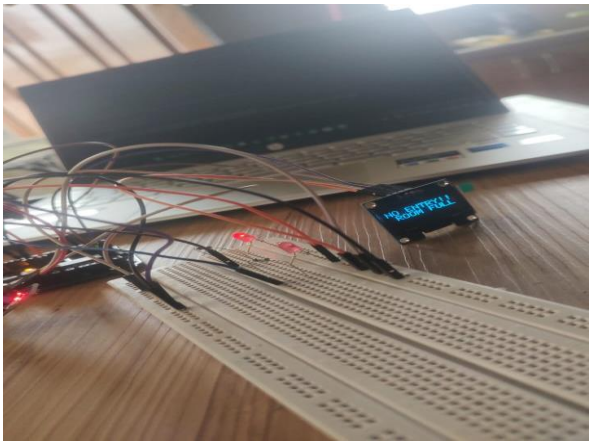

Fig. 5 OLED Display when the room is Completely occupied

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VI. CONCLUSION

The bidirectional visitor counter project represents a practical and effective solution for monitoring and managing the flow of people in various environments. By accurately counting the number of entries and exits, this system provides real-time data on occupancy levels, enhancing safety, optimizing space utilization, and improving overall management.

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