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AUTOMATED CROWD MANAGEMENT AND ENERGY CONSERVATION SYSTEM IN METRO USING IOT

Mr. Sampath Kumar S[1], Chithritha G R[2], Dhanushree C[3] , Harshitha S[4], Meghana B S[5]

Assistant Professor, Department of ECE, K.S Institute of Technology, Bangalore, India[1]

Final year B.E, Department of ECE, K.S Institute of Technology, Bangalore, India[2,3,4,5]

Abstract: With the ever growing global population, crowding in public transport is becoming an increasing menace. Public transport systems around the world have remained largely the same over the past several decades although the population they serve has burgeoned. This paper aims to demonstrate a low cost IoT based solution to the crowding problem by using smart seats that can detect and display the seat occupancy status in real time over an internet or mobile application.

Keywords: IoT, Crowd management, Blynk App, ThingSpeak.

Ⅰ. INTRODUCTION

From the different applications mentioned until now, the detection of crowded areas has been chosen as the research topic for this thesis. This decision has been motivated by the fact that there are different researches focused on the creation of systems thought to perform in crowded areas, but they do not specify what is considered "crowded". Due to this fact, an investigation of the existent literature about the detection of crowded spaces was carried out. The findings were that it was limited, and in the existing research, the threshold to distinguish "crowded" and "not crowded" situations were arbitrarily established by the researchers. In consequence, in this project it is desired to create a method that detects if a place is crowded or not, calculating the threshold to split those situations using mobility data.

Ⅱ. LITERATURE SURVEY

[1] A Low Cost IOT Based Crowd Management System for public Transport: The study presented the management of the crowd using iot method in which the crowd is managed by Mobile application. This paper shows the crowd management system using iot devices like mobile phones. But, which application is developed and how it works for crowd management that is not written in that. It represents crowd management but they can use real time devices to enhance. In a smart transportation system, the smart crowd management component will be demanded for identifying and controlling the congestion that can occur during commutes and routine travel.

[2] Crowd Analysis For Congestion Control Early Warning system On Foot Over Bridge: The proposed congestion control technique exhibits quite significant results on the proposed dataset made from the virtual simulation of FOB (foot over bridge) scenario. This paper proposes a software-oriented approach, Congestion Control Early Warning System (CCEWS), for congestion control with the help of object detection and object tracking technique. Object detection is performed by following the faster R-CNN architecture in which Google inception model is used as a pre-trained CNN model and with Tt the help of proposed object tracking technique the crowd abnormality is analyzed.

[3] Vehicular Crowd Management : An IOT Based Departure Control And Navigation System: Large sport and entertainment events such as soccer games or concerts attract an immense number of fans, most of whom use personal vehicles to get to the event. Such a large number of cars presents a "vehicular crowd" that needs to leave in an organized, timely, and safe manner after the event. This crowd manage through vdc module and navigation system and local cameras. In this Article, The proposed system collects network information from a variety of sensory devices: connected vehicles, smartphones, and traffic cameras. Then, it fuses this data to compute the current state conditions of each road link. Based on these parameters, the VDC module determines the allowable vehicle departure rates, and the navigation module computes the system-optimum routes for drivers to take.

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[4] Crowd Management : The Overlooked Component of Smart Transportation Systems: The paper proposed, Governmental, scientific, and industrial initiatives are developing a new era of smart transportation systems, ambitiously aimed at overcoming the limitations of current transportation infrastructures. These initiatives are designed to cooperate safer, efficient, eco-friendly, and enjoyable transportation for people and goods in large urban areas. However, current research on smart transportation systems has neglected a fundamental building block: smart crowd management. In a smart transportation system, the smart crowd management component will be demanded for identifying and controlling the congestion that can occur during commutes and routine travel It represents smart crowd management but they can use real time devices to enhance.

Ⅲ. METHODOLOGY

BLOCK DIAGRAM:

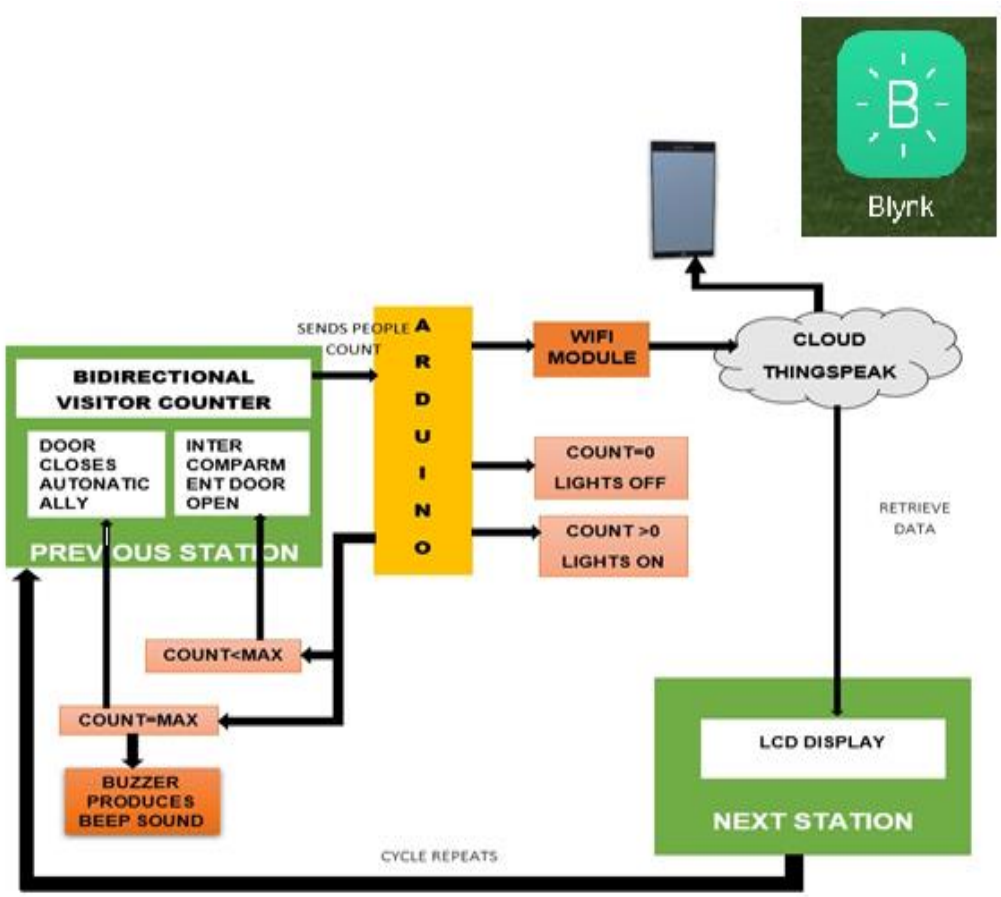

Fig.1 Block Diagram

When the metro reaches the station, the lights inside the compartment is turned OFF,the passengers entering and leaving the compartment is taken using bidirectional visitor counter. If the head count is greater than or equal to one the lights inside the compartment is turned ON. The data captured by sensor is sent to Arduino microcontroller the percentage of compartment vacancy is calculated and sent to the cloud via WiFi module and displayed on LCD in the next station for passengers. A mobile app is created using Blynk app Inventor to display the passengers entering and leaving the compartment in Android mobile. In thinkspeak head count of the passengers entering and leaving the compartment is displayed. If count=max then buzzer produces beep sound and door will close automatically. In case if the count of people leaving the couches increased from the crowded coaches which creates vacancy, and if the neighbouring coach is over crowded then inter compartment doors are opened for effective distribution of crowd and this can be seen through the blynk app application of how many seat are vacant in each compartment and how many are filled and at what time the metro reaches the station by the user at any place with the blynk app application installed in his mobile. This is about the working part of our proposed model.

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DETAILS OF COMPONENT:

Hardware Component:

1. Arduino-UNO

Fig. 2 Arduino-UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, anICSP header, and a reset button. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to getstarted. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter."Uno" means one in Italian and is named to mark theupcoming release of Arduino.

2. Bidirectional visitor counter

Fig. 3 Bidirectional visitor counter

It works on the principle of IR sensing. Infrared or simply IR Sensors are devices that work with Infrared Light Source and a Photo Detector like a Photo Diode or a Photo Transistor that act as a Transmitter and Receiver respectively. Output from each sensor is fed to the microcontroller. In normal operation, IR light from the LED would not fall on the Photo Diode as it is a Reflective type IR Sensor. The output from the sensor would be a logic LOW signal in this case. In case of any interruption (due to any person crossing the path), the Photo Diode would start receiving the IR Light and start conducting. As a result, the output from the sensor would be a logic HIGH signal.The transition from low to high, for each sensor pair is detected by the microcontroller and accordingly the count would be increased or decreased.

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3. Wi-Fi module

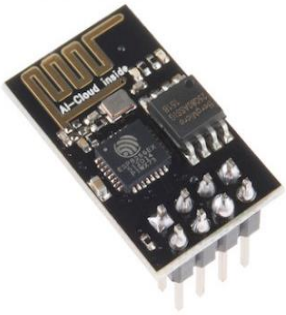

Fig. 4 Wi-Fi Module

WiFi modules (wireless fidelity) also known as WLAN modules (wireless local area network) are electronic components used in many products to achieve a wireless connection to the internet. An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems. Espressif systems designed the ESP8266 Wi-Fi module to support both the TCP/IP capability and the microcontroller access to any Wi-Fi network. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design.

4. LCD Display

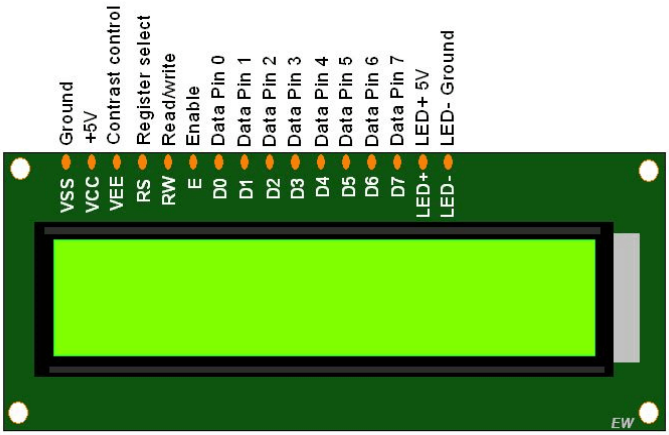

Fig. 5 LCD Display

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. They work by using liquid crystals to produce an image. The liquid crystals are embedded into the display screen, and there's some form of backlight used to illuminate them. The actual liquid crystal display is made of several layers, including a polarized filter and electrodes.There are several benefits associated with LCD displays, one of which is the simple fact that they do not suffer from image burn-in. Commonly found in other electronic displays, image burn-in is a phenomenon that occurs when the image remains in the display after it has been changed.

5. Buzzer

A buzzer or beeper is **an audio signaling device**, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. The flexible ferromagnetic disk is attracted to the coil when the magnetic field is activated, then returns to rest when the magnetic field is off. By oscillating the signal through the coil, the buzzer produces a fluctuating magnetic field, which vibrates the disk. This movement makes the buzzer sound.

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Fig. 6 Buzzer

SOFTWARE COMPONENTS

6. Arduino IDE

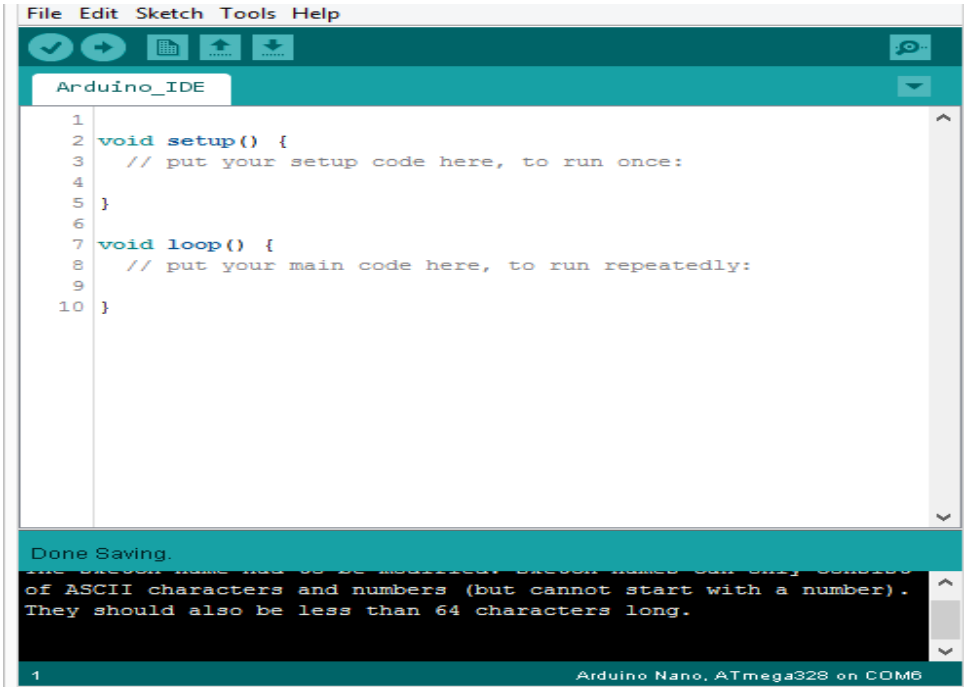

Fig 7. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++.

7. Blynk App

Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, you can turn pins on and off or display data from sensors. Whatever your project is, there are likely hundreds of tutorials that make the hardware part

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pretty easy, but building the software interface is still difficult. With Blynk, though, the software side is even easier than the hardware. Blynk is perfect for interfacing with simple projects like monitoring the temperature of your fishtank or turning lights on and off remotely. Personally, I'm using it to control RGB LED strips in my living room.

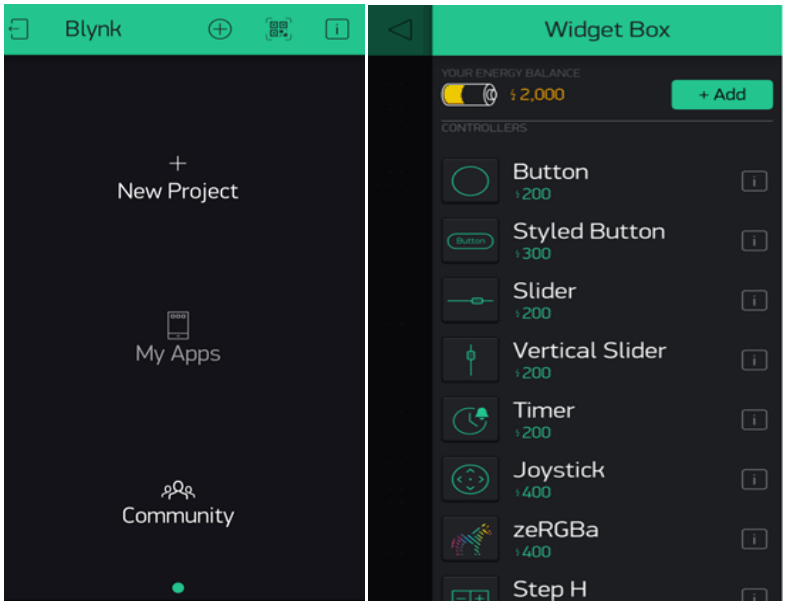

Fig 8. Blynk App

8. ThingSpeak

Fig 9. Thingspeak

ThingSpeak is an application platform for the Internet of Things. ThingSpeak allows you to build an application around data collected by sensors. Features of ThingSpeak include real-time data collection, data processing, visualizations, apps, and plugins. At the heart of ThingSpeak is a ThingSpeak Channel. A channel is where you send your data to be stored. Each channel includes 8 fields for any type of data, 3 location fields, and 1 status field. Once you have a ThingSpeak Channel you can publish data to the channel, have ThingSpeak process the data, and then have your application retrieve the data.

Ⅳ. PROPOSED SOLUTION

Energy Conservation: Usually in metro if no passengers are there but still the lights inside the compartment is turned ON, our project overcomes this drawback only if the head count is greater than or equal to 1, the lights inside the compartment is turned ON.

Crowd Management: Usually in metro the distribution of passengers are unequal. Where as in our project distribution of passengers in each compartment is equal.

Ⅳ. CONCLUSION

Given the increasing need for crowd management systems in today's public transport and the paucity of IoT implementation in the same, this project has demonstrated a robust, cheap and scalable system to mange crowds in public transport. The software simulation was carried out to check feasibility of such a system to work in a real time environment. The project design was built and tested for various loads and seating profiles to better estimate the threshold. The prototype was built and tested in real time seating environments. The final results show promise for implementation in the real world. Further work can be done to account for standing passengers, implementing addressing schemes to increase scalability and introduce web development to improve the webpage interface.

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