



BUILDING AUTOMATION SYSTEM USING BI-DIRECTIONAL VISITOR COUNT

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ABSTRACT

In today's world, there is a continuous need for automatic appliances with the increase in standard of living; there is a sense of urgency for developing circuits that would ease the complexity of life. The objective of this project is to make a controller-based model to count number of persons visiting room and display on the IOT. In our project we use IR sensors to detect the presence of a person. According to this project, two IR sensors are placed apart with a fixed known distance. Whenever IR rays are interrupted by a person during first sensor the count timer is started. This count value is displayed on the IOT; if it is obtained at second sensor then the count will be decreases depending upon the crowd, lights will be on or off. Depends on the no of count inside the room according to that lights will turn on, when the count in room decreases automatically lights in the room turn off. We proposed the microcontroller which interfaces the IR sensors and IOT module, process input and produce regarding output.

Keywords: Automatic appliances, IOT, IR sensor.

1. INTRODUCTION

In today's world, there is a continuous need for automatic appliances. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Many times, we need to monitor the people visiting some place like shopping mall. To provide solution for this we are going to implement a project called "Bi Directional Digital Building Automation Visitor Counter" with automatic room light control. This project has a "Building Automation Visitor Counter". Basic concept behind this project is to measure and display the number of persons entering in any room like seminar hall, conference room etc. LCD displays number of people inside the room. We can use this project to count and display the number of visitors entering inside any conference room or seminar hall. This works in a two way. That means counter will be incremented if person enters the room and will be decremented if a person leaves the room. In addition, it will automatically control room lights. When the room is empty the lights will be automatically turn off. A few days back, we organized a seminar in Pearl Continental, Conference Hall. Main issues we faced were that firstly, few people were trapped inside hall and security guards closed conference rooms after finishing seminar, because they (security guards) were unaware of total number of people inside hall. Moreover, we couldn't analyse the feedback of people and number of people attending the seminar as there wasn't any registration process. Lastly, after ending of seminar, electrical appliances such as Air coolers and fans were left



unattended, this caused electricity wastage. All these problems gave me perspective that if we could somehow analyse the number of people entering and leaving halls, these drawbacks could be avoided. This promoted the idea of Bidirectional Building Automation Visitor Counter in our mind through which we can keep a check on number of people and allow all people to leave any building before sealing it. We can also count number of people to analyse the feedback of people on any event. And most importantly, in case of all people leaving a premise, all electrical appliances will be turned off automatically leading to saving of electricity.

Building Automation Visitor Counting is simply a measurement of the visitor traffic entering and exiting conference rooms, malls, sports venues, etc. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Over the years, the usage of Building Automation Visitor Counters has become very positive in terms of monitoring crowd behavior at a particular place. It began with a mechanical tally counter which was introduced to replace the use of tally stick. A tally (or tally stick) was an ancient memory aid device used to record and document numbers, quantities, or even messages. Historical reference is made by Pliny the Elder (AD 23–79) about the best wood to use for tallies, and by Marco Polo (1254–1324) who mentions the use of the tally in China. Tallies have been used for numerous purposes such as messaging and scheduling, and especially in people counting, financial and legal transactions, to the point of being accuracy [22, 19]. The substitute of the tally stick was the mechanical tally counter, it is a device used to incrementally count something, typically passing. One of the most common things tally counters are used for is counting people, animals, or things that are quickly entering and existing a location. As times went on, an electronic tally counter was introduced which used an LCD screen to display the count, and a push button to advance the count. Some also have a button to decrement the count in case of a miscount. Now, due to technology advancement, various type of people counter has been introduced to automatically count the number of people entering and exiting a building at a particular time. Some of these are laser beam, thermal imaging, video camera and the infra-red sensor. All these sensors play their role respectively as visitor detector. These devices are very reliable and accurate in terms of performance as compared to the mechanical tally counter.

2. LITERATURE SURVEY

In the past years, several well-established institutions (libraries, community centers, auditorium, etc.) across the globe have encountered various incidents related to traffic monitoring. It has been a necessity to monitor the visitors to carry out the human traffic management task and tourist flow estimate to vindicate accurate result for the organizational marketing and statistical research. This eventually indicates the patronage rate of goods and services by consumers. Therefore, we deem it appropriate to identify these problems encountered by our various organizations and find solutions to them by designing a digital bidirectional Building Automation Visitor Counter (DBVC). The primary method for counting the visitors involves hiring human auditors to stand and manually tally the number



of visitors who enter or pass by a certain location. The human auditing application or the human-based data collection was unreliable and came at great cost. For instance, in situations where a large number of visitors entering and exiting buildings such as conference rooms, law courts, libraries, malls and sports venues, going for human auditors to manually tally the number of visitors may result in inaccurate data collection. For this reason, many organizations have tried to find solutions to mitigate the inaccurate traffic monitoring issues. It is our intention to design and construct this digital bidirectional Building Automation Visitor Counter (DBVC) with maximum efficiency and make it very feasible for anyone who wants to design and construct the prototype. Building this circuit will provide information to management on the volume and flow of people in a building [4]. Our main objective in this paper includes designing and constructing a Building Automation Visitor Counter which will make a controller-based model to count and compute the number of visitors in a building at a particular time. It is also our objective that this controller base model beeps a warning alarm when the capacity of the building is exceeded. The significance of the design and construction in this paper is enshrined in the fact that it provides the assurance of the health and safety of the occupants in a building at all time, since the visitors are guaranteed of traffic decongestion. It also provides accurate data for various research and analytical purposes as it generates the hourly, daily, monthly, and yearly report. The device helps to reduce pressure on building facilities by prompting the security, when the capacity of the building is exceeded. It goes a long way to assist rescue team or security services to come up with strategic procedure in dealing with emergency issues like people trapped in a structure as a result of hijacks and collapsed building which occurred recently at the West End Gate Mall in Kenya and Melcom in Ghana respectively. It is the usual norm that the design and construction of every device comes with some limitations and ours cannot be an exception. In this paper, our device might count more than two people as one when they interrupt the infrared beam at the same time in a linear direction. For this reason, the device must be installed at a narrow entrance/exit where one person enters at a time. Another limitation can be linked to the inability of sensor in the device to differentiate between human being and objects interrupting the IR signal. Finally, the device will fail to function in case of any power interruption, which might lead to a miscount or provide inaccurate data when power is restored. Industries require a huge number of work force and maintenance. Here in this given paper, we have taken steps to ease the industry work by reducing the consumption of electricity and providing safety features which will not lead to dangerous situations. This will ease the work of electricity maintenance. Over many years, counters are used in many areas. Here microcontroller is replaced with an arduino board for better results and less complexity. The sensors used in this circuit are very efficient in terms of execution in comparison to the manual tally counter. This circuit can be used in many places like classroom halls, an auditorium, libraries, community halls, etc. It is a necessity to monitor the visitors for better human traffic management. The initial method for counting the visitors involves hiring people to stand and manually calculate the number of guests or workers who enters or exits by a specific location. The human counting was unreliable and came at a great

cost. It may be confusing for a person to tally the quantity of individual entering and leaving at a same time. Our intension is to design and develop this system to manage human traffic in a large industry and also conserve the usage of electricity. Our main aim in this paper adds constructing a Building Automation Visitor Counter which will make a controller circuit model to count and calculate the number of guests in a building or room at a particular time and all the electrical appliances will be turned on and off accordingly. It is also our aim that this controller base circuit model beeps a warning alarm for safety purposes when the capacity of the building and the temperature exceeds.

3. PROPOSED SYSTEM

The IR transmitter will emit modulated 38 kHz IR signal and at the receiver we use TSOP1738 (Infrared Sensor). The output goes high when there is an interruption and it return back to low when there is no obstacle to the ray. Input is given to the Port 4 of the Arduino microcontroller. Port 8 to 13 is used for the 7-Segment display purpose. Port 2 is used for the Relay/LED Turn On and Turn off Purpose. LTS 542 (Common Anode) is used for 7-Segment display. And that time Relay/LED will get Voltage and triggered so light will get voltage and it will turn on. And when counter will be 00 that time Relay will be turned off. In this bidirectional circuit two infrared (IR) sensor components are used for up and down counting, respectively. Whenever an interruption is observed by the IR sensor then the IR sensor increment the value of counter and whenever the second sensor detects any obstacle, the counter is decremented. The number of interruption count depend upon the sensor's input and displayed on a set of seven segment displays by using the concept of multiplexing (for concept of multiplexing refer seven segment multiplexing). The IR sensor input is defined as up and down selector mode for the counter in the code. Every time the first sensor is blocked, the first sensor gives a high voltage signal and the count the value gets incremented. The value of second sensor gets decremented when connected to second a sensor, gives high input. At every setup, the value of the counter is sent and Digital Building Automation Visitor Counter displayed it on the Sensor, gives high input. At every setup, the value of the counter is sent and displayed it on the lcd module.

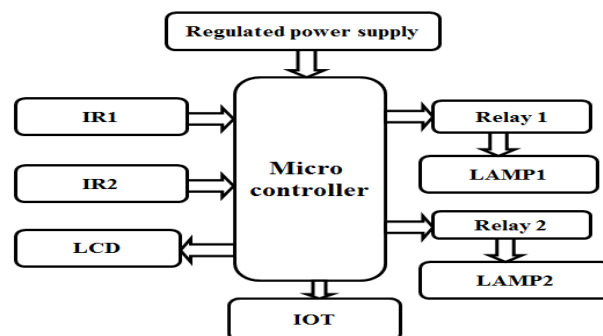


Fig. 1: Block diagram of proposed system.

The IR sensor continuously senses the presence of any obstacles (a person in our case). → If sensor 1 senses a person, it informs the controller that a person has entered so that controller can increment the count. → At the same time, it gives a delay of 1sec so that the person can cross the sensor 2 and the count is maintained correctly. → When a person exits, the sensor 2 informs the controller to decrement the count. Similarly, it also provides a delay of 1 sec to maintain count properly. → The count is displayed on LCD by the controller. → If there is at least 1 person is inside the hall, an LED will glow otherwise it is off.

4. RESULTS

4.1 Arduino IDE

What is 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.

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).

4.2 Schematic diagram

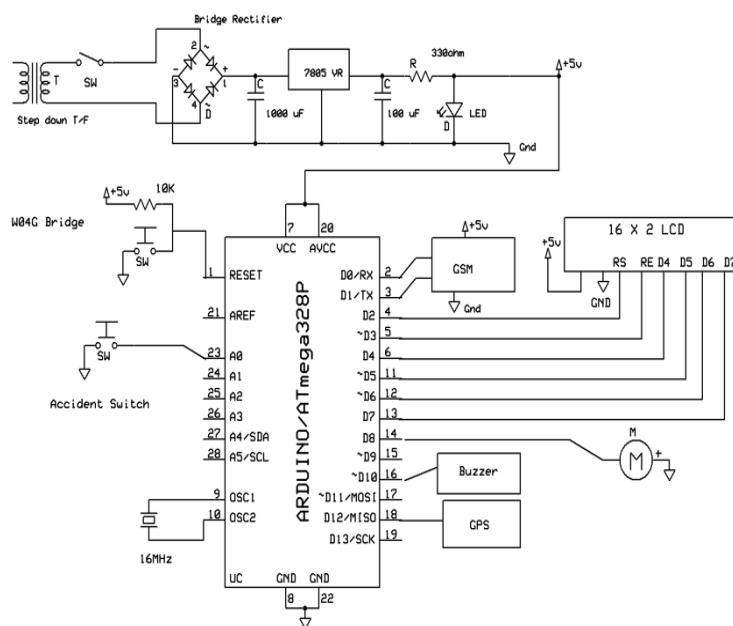
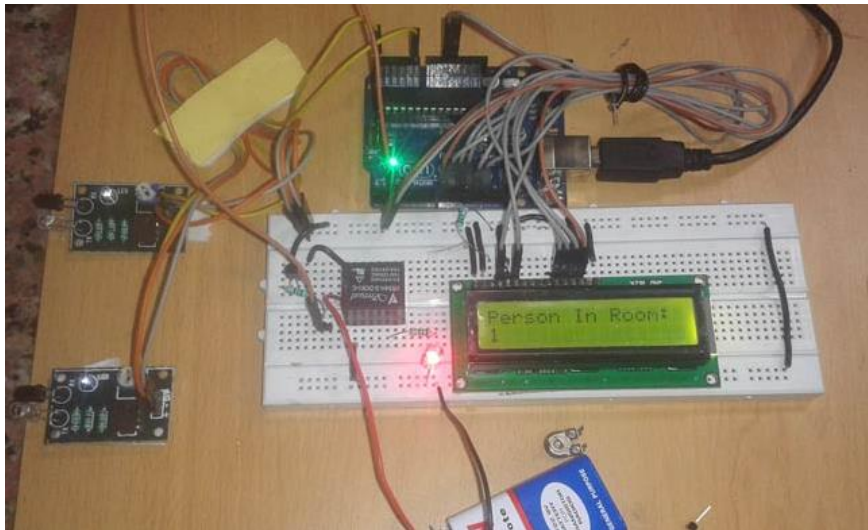


Fig. 2: Schematic diagram of proposed system.

4.3 Hardware implementation



5. CONCLUSION

In today's world, there is continuous need automatic appliance will be increase in standard of living, there is a sense of urgency for developing circuit that would ease the complexity of life. Also, if someone wants to know the number of persons present in a room so as not to have congestion, the circuit prove to be helpful. The theme of this project when merged with certain established technologies can be quite effective in number of countries like Germany, France & Japan etc. which control the train. This Project is useful in developing countries and this project has a bright future. This project helps us to control the light of a room automatically and counts the number of persons/visitors entering and leaving the room. By using this circuit and proper power supply we can implement various applications such as fans, tube lights etc



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