GJR Publication
OPEN ACCESS
Global Journal of Research in Engineering & Computer Sciences
ISSN: 2583-2727 (Online)
Volume 02| Issue 02 | March-April | 2022
Journal homepage: https://gjrpublication.com/journals/
Original Research Article

Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

*Muhammad Ahmad Baballe[1], Mukhtar Ibrahim Bello[2], Abubakar Abdullahi Umar[3], Dahiru Bello[4], Shehu Atiku Muhammad[5] and Suleiman Rabiu Dan Sharif[6]

[1,3,4]Department of Computer Engineering Technology, School of Technology, Kano State Polytechnic, Kano, Nigeria.
[2,6]Department of Computer Science, School of Technology, Kano State Polytechnic, Kano, Nigeria.
[5]Department of Mechatronics Engineering, School of Technology, Kano State polytechnic. Nigeria

DOI: 10.5281/zenodo.6459830 Submission Date: 06th April 2022 | Published Date: 13th April 2022

*Corresponding author: Muhammad Ahmad Baballe
Department of Computer Engineering Technology, School of Technology, Kano State Polytechnic, Kano, Nigeria
Orcid Id: 0000-0001-9441-7023

Abstract

The visitor counter with automatic gate control is a device capable to help against COVID19 and monitor the density of people within the premises and automatically control the light in the room. The door allowing the person to enter beyond the limit is ok, the door will not allow anybody to enter the room if the number of people is equal to the limit nobody can have access to the house, room, offices, organizations, or industries. The device used Infrared Ray sensors for both in and out of the house and the system is interfaced with a microcontroller atmega328P, it uses L293D as a door driver that allows the user to enter and exit the room or house. The LCD displays the performance of the research. The Light Emitting Diode Green indicates the number of people in the house is below the required limit registered in the system while the Red LED indicates the equal number of people leaving the house has reached the required limit registered in the system. The buzzer will alarm if the number of people is equal to the number of people register in the system and the door will never open again until one person leaves the house then another person can enter again. Automated appliances are in high demand in today's world. With rising living standards, there is an urgent need for the development of circuits that would reduce life's complexity to simplicity. This research, titled "Visitors Counter with Gate Control and Automatic Light Control (ON/OFF)," is designed and presented to count visitors to an auditorium, hall, offices, malls, sports venues, and so on. The system tracks both entering and exiting visitors to the auditorium, hall, or other location where it is installed. The system identifies the visitor's entry and exit based on the interruption of the sensors. When the system is successfully implemented, it displays the number of visitors present in the auditorium or hall. When used in places where visitors must be counted and controlled due to the outbreak of this COVID19, this is a cost-effective system. Counting visitors can be time-consuming, so it helps to maximize employee efficiency and effectiveness, time savings, and an organization's sales potential, among other things.

Keywords: Microcontroller atmega328P, LEDs, LCD, TSOP1738 Infrared Sensor, Door Control., DC Motor.

INTRODUCTION

The Bidirectional Visitor Counter with an Automatic Room Light Controller is a reliable circuit design that takes over the chore of monitoring the gate and room lights as well as counting the number of visitors entering the room quite correctly. If a person enters the room, this Counter is incremented by one value and the light in the room is automatically switched ON. At the same time, if someone leaves the room, this Counter is decremented by one value and the light in the room is automatically switched OFF. On the LCD screens, the total number of people entering and leaving the room is also seen and displayed. The above task is performed by and controlled by a microcontroller. It receives signals from sensors, and this signal is controlled by Arduino software (IDE). Also, the total number of people in the room, whether incremented or decremented, will still be reflected in the LCD, making this device very user friendly.

Literature Review

In [1], this research is designed and presented to count the number of visitors entering an auditorium, hall, offices, malls, sports venue, and houses. This system tracks both entering and exiting visitors to the auditorium, hall, or other location where it is installed. The system automatically identifies the visitor's entry and exit based on the interruption of the Infrared Ray sensors. If the system is successfully implemented, it displays the number of visitors present in the auditorium or hall that has entered. When used in places where visitors must be counted and controlled, the system is cost-effective. The Counting of visitors can be time-consuming, so it helps to maximize employee efficiency and effectiveness, time savings, and an organization's sales potential, among other things. In [2], the objective of this research is to decrease the high and ever-increasing demand for electricity. As the technology improvements preponderate in today's digital world, we prefer classier and smarter developments in simple and basic needs of human lives, so this paper gives us a solution to make the surroundings economic and smarter. To achieve this objective, we can install Automatic Room Monitoring in every institution, Industries, organization, hall, and House. This design uses infrared ray sensors to detect the persons entering and leaving the room and monitors the room appliances like fans, light, and air conditioners. Developing and generating electricity at a small scale is a cumbersome process instead we consume less electricity and conserve it for sustainable development of energy resources. The proposed archetypal from the paper can control and monitor the room appliances respective to the people in the room additionally it can also immediately count the number of persons in a room. It has various applications in the field of consuming energy resources and also as a bi-directional visitor counter. The author in [3], This paper is "Automated light controller with visitor counter system" is a reliable circuit that is controlling the room lights with count the number of persons or visitors in the room. If anybody or someone enters the room the counter will be incremented and the light in the room will be switched ON if the person or anyone leaves or comes out of the room or place the device is installed then this counter is decremented. The light will be switched OFF until all the persons or visitors leaves the room. The number of persons or visitors inside the room is displayed on the LCD. The microcontroller does this work. It receives the signals from the IR sensors, and this signal is operated under the control of source code which is stored in the microcontroller. The Microcontroller atmega328 continuously monitors the Infrared sensor since is the brain of the system. When any object passes or interrupts the IR sensor signal is sent to the microcontroller and the result is displayed on the LCD. In [4], This research describes a circuit that is used for monitoring the room lights according to the count of persons in the room and instantaneously works as a security system when the camera is attached. When somebody enters the room then the counter will be incremented accordingly the LED light in the room will be switched ON and when anyone leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the LED lights will be ON according to the total number of persons inside the room and the count will be displayed. The author [5] in this research, the Congestion control Bidirectional Digital visitor counter is a consistent circuit design which is mostly designed to monitor the room appliances as well as to count the number of people or individuals entering the arena very precisely and likewise avoids overcrowding in the different areas of usage. When a person enters the arena, a counter is maintained for presenting the number of people and is updated by one and the appliances in the arena will be turned ON when a person leaves the arena counter is maintained for presenting the number of people and is decreased by one. The appliances will turn OFF when all the people in the arena go out. The overall count of people inside the arena will be presented on LCD. When a particle passed through the Infrared Receiver's then the Infrared Rays falling on the receivers are obstructed. This obstruction is sensed by the Microcontroller. It also can manage fans based on the relay provide, If the room reaches the maximum capacity, then by using a Wi-Fi module message is sent to authorities to limit the person entering the room. Thereby congestion is avoided. In [6], In this digital world, the use of technology is very advanced and we prefer things to be done automatically without any human effort. This research likewise aids to decrease human efforts. Likewise, it is very useful to conserve resources. In today's world, there is a continuous need for automatic appliances. With the increase in the standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Also, if at all one wants to know the number of people present in the room so as not to have congestion, this circuit proves to be helpful. An automatic room light controller with a visitor counter is a reliable circuit that takes over the task of controlling the room lights as well as counting the number of persons and visitors in the room very precisely. The author In [7], This paper presents the design and construction of a digital bidirectional visitor counter (DBVC). The DBVC is a dependable circuit that takes over the task of counting the number of persons and visitors in the room very precisely and beeps a warning alarm when the number of visitors exceeds the capacity limit of the auditorium or hall. When somebody enters the room then the counter is incremented by one (+1) and when anyone leaves the room then the counter is decremented by one (-1). The total number of persons inside the room is also displayed on the LCD (Liquid Crystal Display). The microcontroller is used for detecting an entry or exit action and computing the figures (addition and subtraction) to acquire accurate results. It receives the signals from the sensors, and this signal is operated under the control of embedded programming code which is stored in the ROM of the microcontroller. The microcontroller continuously monitors the Infrared Receivers. When any object passes through the IR Receiver's then the IR Rays falling on the receivers are obstructed. The obstruction occurs under two circumstances, either you obstruct sensor 1 (i.e., outside the building) before sensor 2 (i.e., which is inside the building) this shows that you are entering the building or you do it the other way round, which is obstructing sensor 2 before sensor 1 to indicates an exit movement. This

obstruction is sensed by the Microcontroller, computed, and displayed by a 16x2 LCD screen. The author in [8], A Study on the Impact and Challenges of Temperature Detection System.

MATERIAL AND METHODS

The materials used in this research are shown in Table I below.

Table I: materials used in this research

S/N	Name of components	Number used
1	Atmega16 microcontroller	1
2	Tsop1738 (infrared sensor)	2
3	Buzzer	1
4	Jumper wires	20
5	Resistor	2
6	Number of connections	10
7	Light Emitting Diodes	3
8	Regulator	1
9	Transistor (BC547)	1

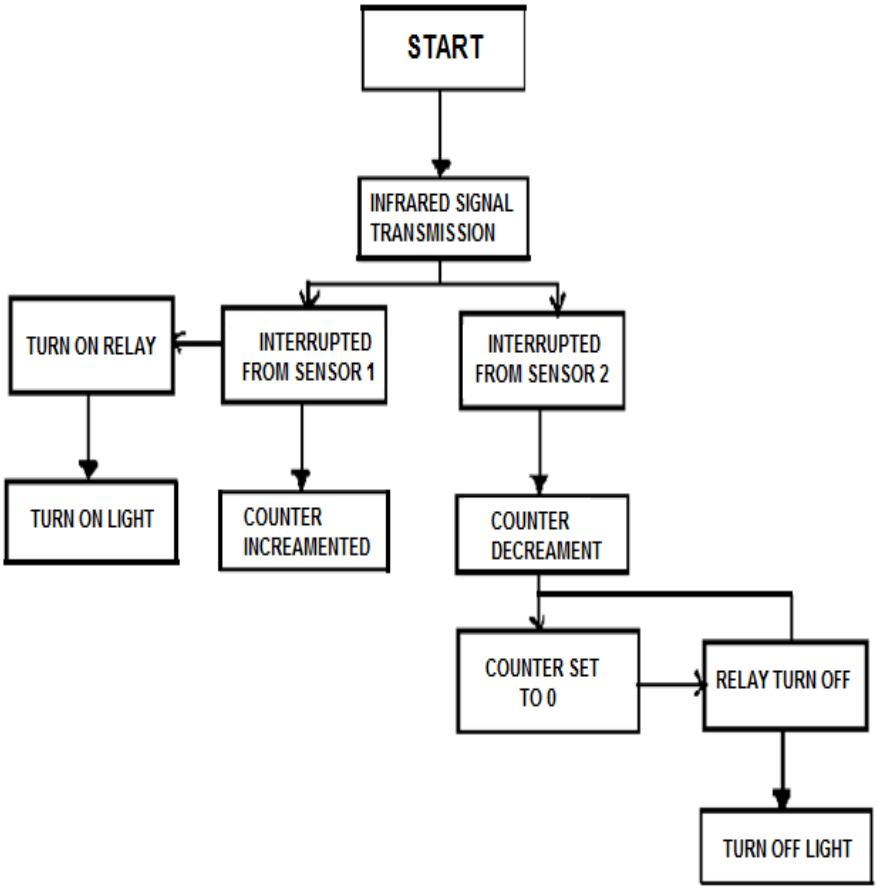

Fig. 1: The Flow Chart of the System Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

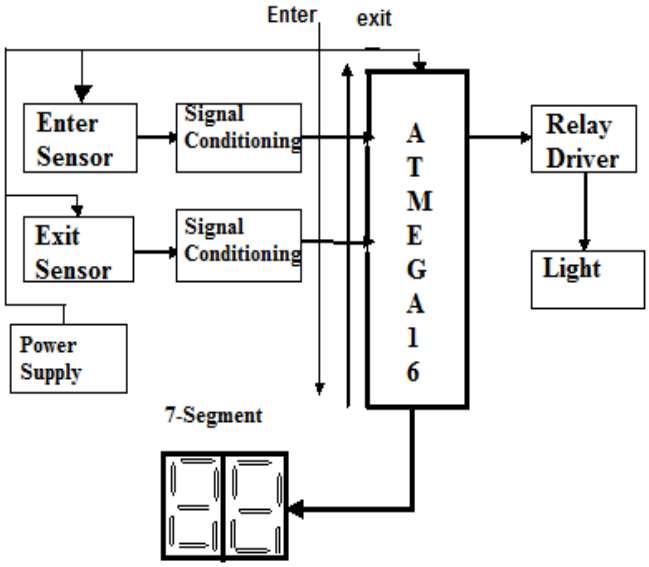

Fig. 2: Basic Block Diagram of the System Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

Methods

The figure below is a complete circuit diagram of an infrared-operated bedroom light switch with a bi-directional counter. The operation of the circuit is simple and easy to comprehend. Firstly, the power supply is switched ON, then you have to press the open-door button to have access to the (open the door). If the door is now open, and the person enters the room the light-emitting diode receives an infrared signal that has been sent back to an IR sensor which drives the photodiode that is inside the room to turn activate with the help of the microcontroller atmega16 (the brain of the whole system). The microcontroller atmega16 is loaded by a program capable of controlling the LCD for display and the transistor for turning ON/OFF of the LEDs. A microcontroller tries to recognize the specific source of signal when clucked by any of the photodiodes. If the signal comes from photodiode 1 (that is the entering of a person into the room) the microcontroller increments the counter to (plus) +1, +2, +3 then the LCD shows a number; 1, 2, 3 while the transistor energizes to turn on the light. But if the signal is from photodiode 2 (that is the person is exiting the room), the microcontroller decrements the counter (minus) to -1, -2, -3 and then the LCD starts to decrease the numbers; 3,2,1, and the light will still be on until the last person goes out from the room, then the LCD will then automatically show zero people remaining.

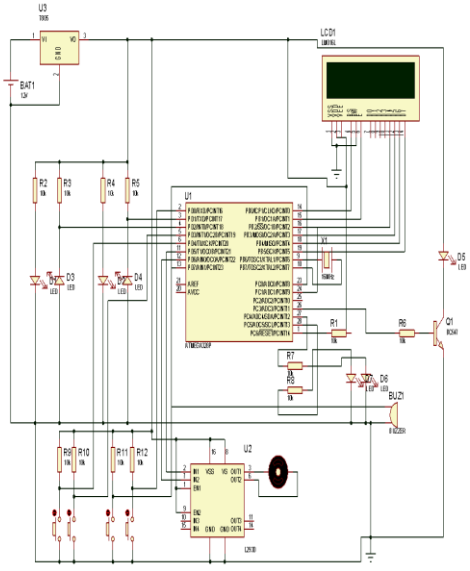

Fig. 3: Complete Circuit Diagram of the Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

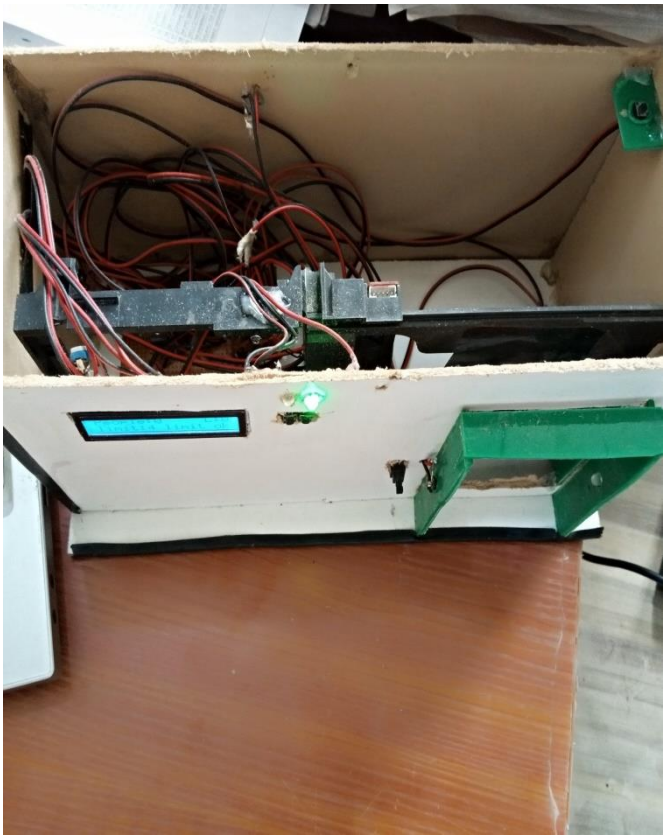

Fig. 4: Implementation of the Circuit Diagram of the Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

RESULT

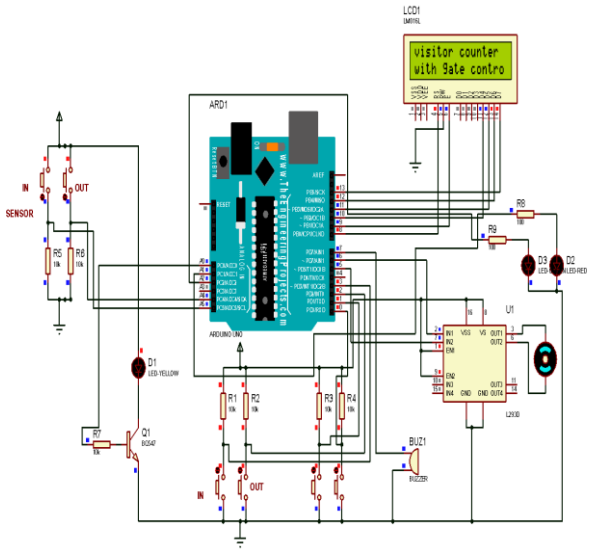

Fig. 5: Simulation result displaying title of the research Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

Fig. 6: Implementation of the Circuit Display Visitor Counter with Gate Control

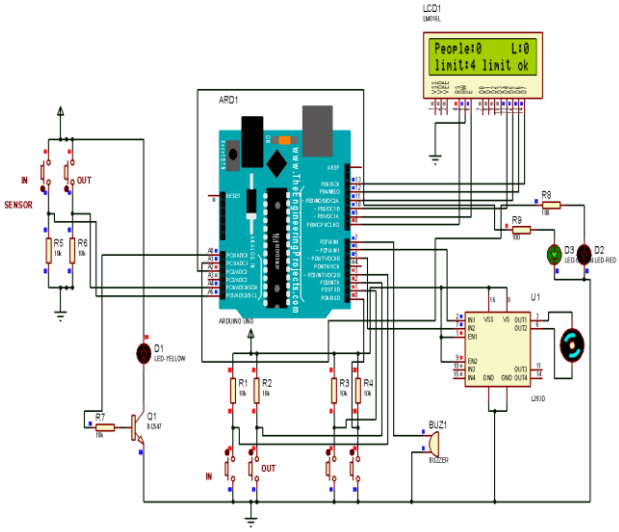

Fig. 7: Simulation Result Displaying Nobody is in the Room (people zero): Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF)

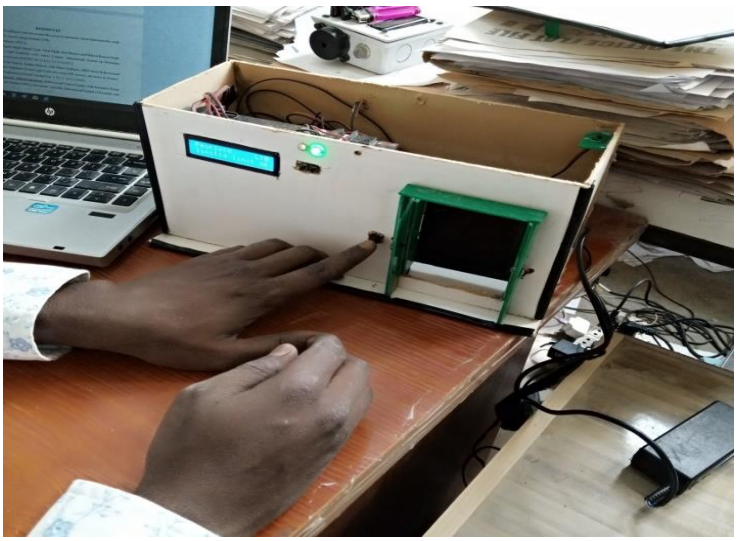

Fig. 8: Implemented Circuit Displaying the Process of Pressing the Entrance Door

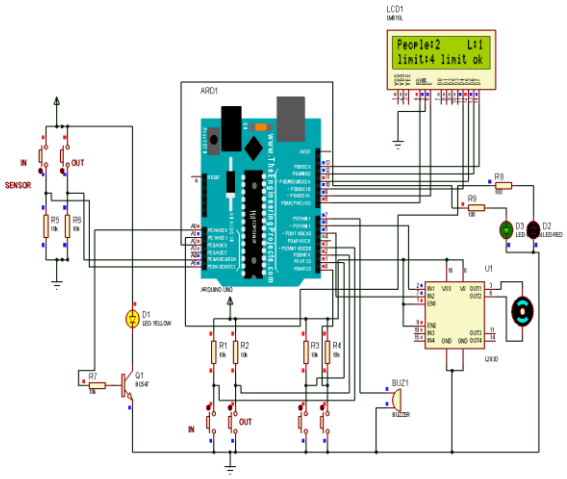

Fig. 9: Simulation Result Displaying Two Peoples are in the Room

Fig. 10: Implemented Result on the Entrance Door

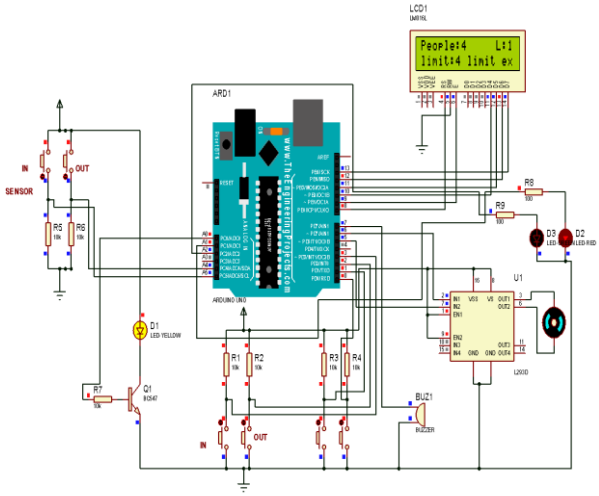

Fig. 11: Simulation Result Displaying the Maximum Number of Peoples in the Room

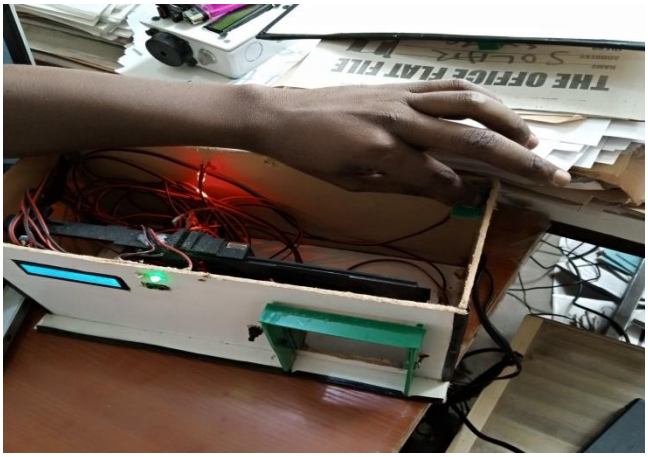

Fig. 12: Implementation Result Showing the Process of Pressing the Exit Button

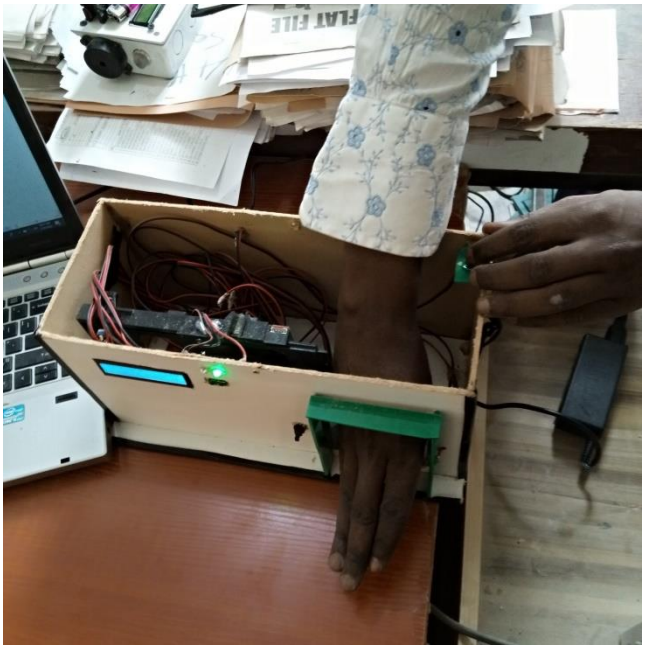

Fig.13: Implemented Result Showing the process of leaving the House at the Door

Conclusion

This paper proposes and implements a novel architecture for an economic Bidirectional Visitor Counter, gate control, and automatic light controller. It explains how the microcontroller is used to power the bidirectional guest counter, gate control, and, a room light controller. The cost of this equipment is very low. This research makes use of low-cost, off-the-shelf materials. As a result, the net deployment cost is very low and affordable to the average consumer especially those from Africa. This low-cost scheme is intended to increase the quality of living and the difficulty of guest counting and also avoid unnecessary entering due to the high rise of the COVID19. It contains reliable data and strives to eliminate errors whenever possible. Any recommendations for future work can be made, such as the installation of cameras from which not only the count but also the image can be precisely processed.

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CITE AS
M. A. Baballe, M.I. Bello, A. A. Umar, D. Bello, S. A.Muhammad, & S. R. Dan Sharif. (2022). Visitors Counter with Gate Control and Automatic Room Light Controller (ON/OFF). Global Journal of Research in Engineering & Computer Sciences, 2(2), 32–40. https://doi.org/10.5281/zenodo.6459830