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Design of Smart College Using Raspberry Pi

[1] Mortada Mohammed Abdulwahab, [2] Hussam Omer, [3] Asaad Omer, [4] Omer Ayoub

[1] Faculty of Engineering & Technology - Department of Electronic Engineering - Gezira University
[2, 3, 4] Alnour collage of science and Technology
(E-mail: mail:murtadaabdelwahab@gmail.com)

Abstract: Smart College refers to the technologies that have been developed to satisfy the needs of students and teachers in order to feel more confident in the education environment. These technologies facilitate the process of entry and exit and help to organize the time, these technologies also save the use of energy. The proposed design in this paper offers a complete control of all the electronic devices in the hall, whether within the collage or remotely from any place outside the college by using either android system or Wi-Fi technology. The design guarantees the system security, it does not allow anyone who is not authorized to enter or access it. The basic architecture of this design consists of raspberry pi device, group of drivers and relays .The system enables the manager of it to adjust the operation time of gates which controls the opening and closing time of the doors at specific time selected by the manager. This paper also includes a survey of most of the existed works related to this field. The proposed system has been experimentally proven to work successfully and it has high level of reiliabity and authentication.

Keywords: *Raspberry pi, Wi-Fi, control, mobile.*

1. INTRODUCTION

Automatic control systems are widely used in many applications and it has been developed rapidly recently due to the large demand for such systems. The real measurement of nations is by their knowledge and uses of modern technology. Raspberry pi is new advance control device invented in United Kingdom [1]. There are two models for the Raspberry PI both have the same RAM size and differ in the number of available USB [2]. It can be used in different applications such as robots applications and environmental monitoring such as temperature and humidity.

Raspberry Pi is optimizing than arduino in many terms such as memory, clock speed, multi-tasking, operating system and flash. Python language is suitable for the purpose of programing Raspberry Pi. There are many designs aimed to provide the concepts of smart home all these designs used modern controls such as arduino and internet of things technologies. In this paper we come over all the requirements to have best environment for both students and teachers using advance control device. The design in this paper controls lighting, motors, fans and doors using connection of Wi-Fi. Login to the system required user and password.

2. SURVEY OF RELATED WORKS

This section of the paper we proposed a survey of most of the works that have been published recently in the field of home or college automation. Mohammed et al[3] presented wireless design of smart home based on microcontroller and offers wireless internet service. Jonathan S [4] shows a survey of the existing works of automated home, it provides model approach for simulation virtual sensors and environment. Sharma in his paper explained an automatic railway gate control system based on RF ID. Murali et al [6] in his design used android smart phone and Bluetooth technology to design smart home automation system, the system has limited range of operation. Subhajit.D, *et al*[7] presented wireless automated home control-employing arduino UNO, Ethernet module, Temperature Sensor, PIR Sensor, IR sensor and web page. Akbar.S, *et al* [8] presented an automation system based on smartphone by employing arduino controller. Pooja.p, *et al*[9] Used raspberry pi control. This system monitors the sensor data and switching on/off devices such lights but it does not includes smart gate control. The presented system in Boban A [10] based on sensor technology electronics and energetics. Vikrant.A, *et al* [11] used in his design an arduino board to employs the integration of server centralized database.

Bethany.K [12] in his paper evaluates the past smart home designs, present existing technologies and highlight areas where development is lacking. Saber et al [13] designed monitoring and control system based on arduino, android and IOT, it offers a control of large number of devices and has many advantages in its web control.

Nisar [14] gives in his paper a survey of all the existing systems and studied their features. Nazmul.H [15] used in his design the motion sensor, SBC-PT connected with home automation network through an internet. Xuling G[16] controlled an electric equipment of classroom, such as lamps and air conditioners in the classroom, it does not offer timing system of the gates and it has different control techniques.

3. . PRINCIPLE OF OPERATION

The design meets all the requirements of the smart college and represents all the processes of control in the hall in a short time with short access control code. Users of the system can access and control the classroom devices from anywhere easily using the chart illustrated in Fig.1. A sequence of procedures occurred while executing a command to provide connection between the

application device such as smart phone and the control device as shown in Fig.2. The executing of command starts by running the application on the application device followed by checking the connection to Wi-Fi. The next step is checking for the status of the devices and returns an acknowledgement massage. Device administrator (Raspberry Pi) is responsible to check the status of device either on or off. Both device administrator and the application device are communicated together in order to illustrate the current state of the devices.

The algorithm that describes the operating mechanism of the system was represented in the flow chart as shown in Fig.3.

Fig.1. User Chart.

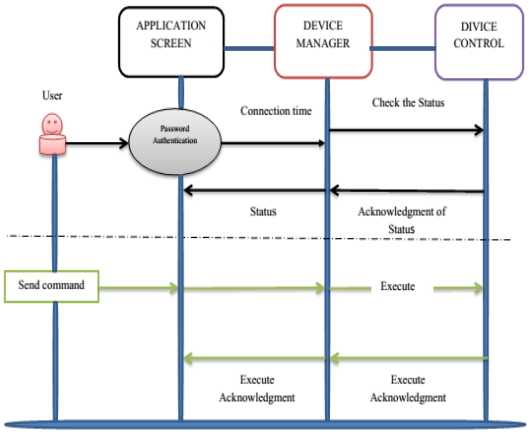

Fig.2. Excitution Stages.

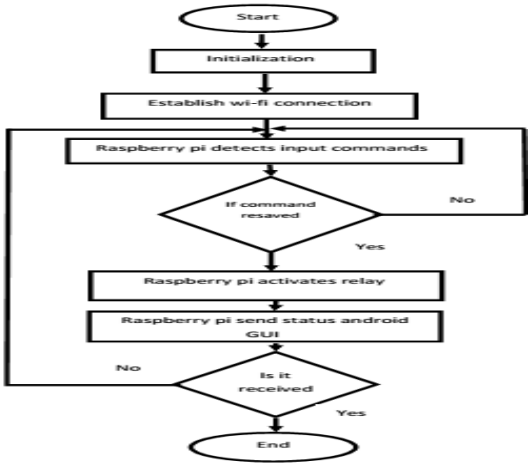

Fig.3. Algorithm Flow Chart.

4. DESIGN OF THE SYSTEM

The block diagram shown in Fig.4 illustrates the basic stages of the design. Rasspberry Pi unit can be thought as the heart of the design. In genral the design controls several devices in the hall using mobile or any computer using Wi-Fi technology. The control process accomplished automaticaly or manully if it necessory. The gates was controled to open and closed at specefic times chosed by the programer. Also it counts the numer of people using this gate this feature helps to control the gates in crowded by opening more gates.

Fig.5 shows the electronc circuit which consist of controller device, drivers, motors in addition to group of sensors and relays.

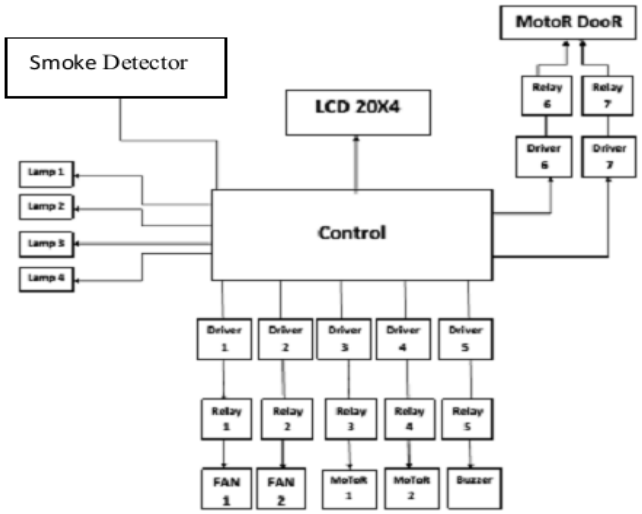

Fig.4. Design Schematic.

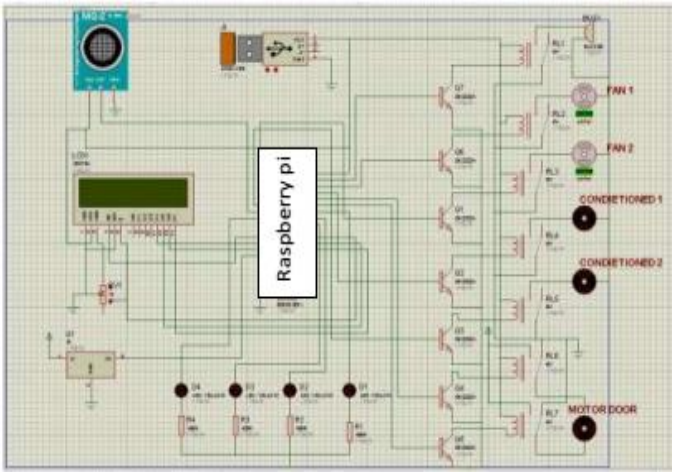

Fig .5. Electronic Circuit.

In general description this design has the following features:

- It provides remote control for all hall devices through Android application.
- It monitors the status of the devices and display information about them.
- It provides security for the system allowing only authorized user to enter.

Using smart phone application user who is authorized to access the application will be able to remote control the hall easily as shown in Fig.6 by sending a specific command which passes through the network (Wi-Fi module) to Raspberry Pi ethernet shield board.

Fig.6. Commands Screen.

The gray color boxes illustrate the status of the port either to be in or out.in this design assumed two type of control manual control via control page in which user able to open or close any device at any time, the second type is done automatically by opening and closing all of the hall equipment's only for specific time once someone enter to it.

VI. EXPERIMENT RESULTS

The experiment results that shown in this section of the paper aimed to identify the functions that can be performed when using this implementation. IR as shown in Fig.7 is a sensitive sensor that can senses the objects, in this design it was used to recognize if person passes to hall thus all devices open automatically at the same time for specific time determined by the programmer.

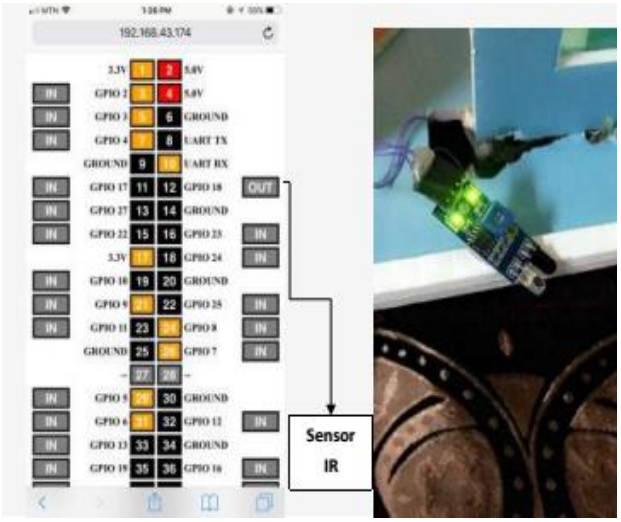

Fig.7. IR sensor.

For lighting the hall four lamps were used. We can control the lamp1 through key 17 as shown in Fig.8.

Simillarly the system can controls lamp(2) through key number nighteen as shown in Fig.9.

Gas Sensor (MQ2) module is useful for detecting gas leakage It abeles to detect i-butane, methane, alcohol, hydrogen, smoke and so on. Fig.10 illustrates the uses of this sensor to monitor any smoke inside the hall.

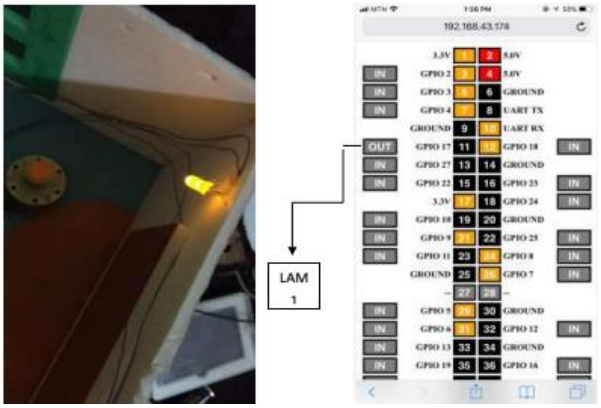

Fig.8. Control of Lamp1.

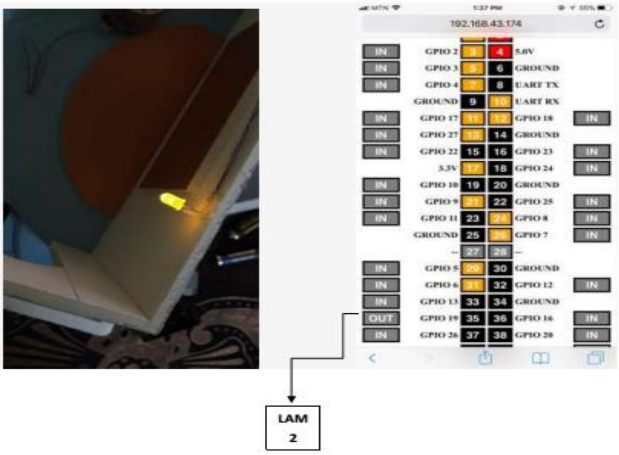

Fig.9. Control of Lmp(2).

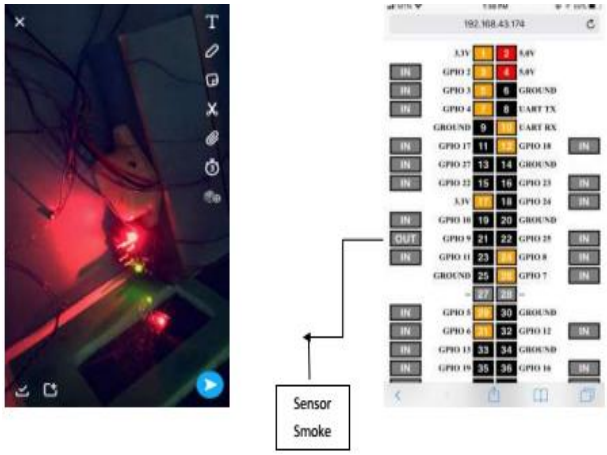

Fig.10. Smoke Sensor.

The sensitivity can be adjusted by the potentiometer. It was connected with a warning bell for alert.

There are two fan were controlled in this paper. Fig.11. illustrates the controlling of fan 1 using key number two.

Two motors assumed in this paper to used in different purpose such as controlling the projector screen. The mechanisum of controlling these motors are shown in Fig.12 and Fig.13.

The control of motor1 and two accompled through key number twenty two and key number twenty respectivly. The door motor

which used to open and close the hall by pressing key number twenty three as shown in Fig.14.

Door can be adjusted to open in certain time as the application needed.

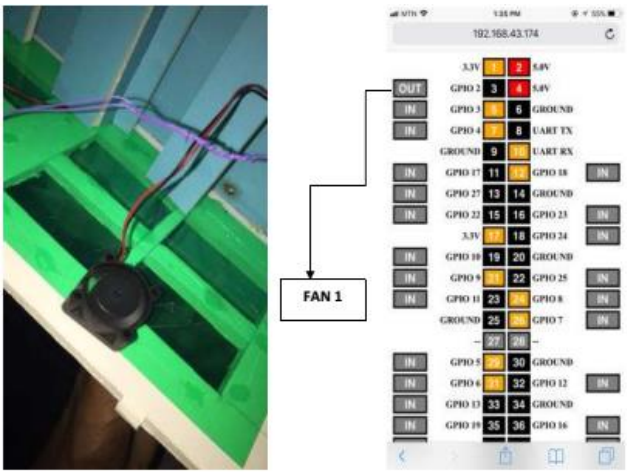

Fig11. Fan Control.

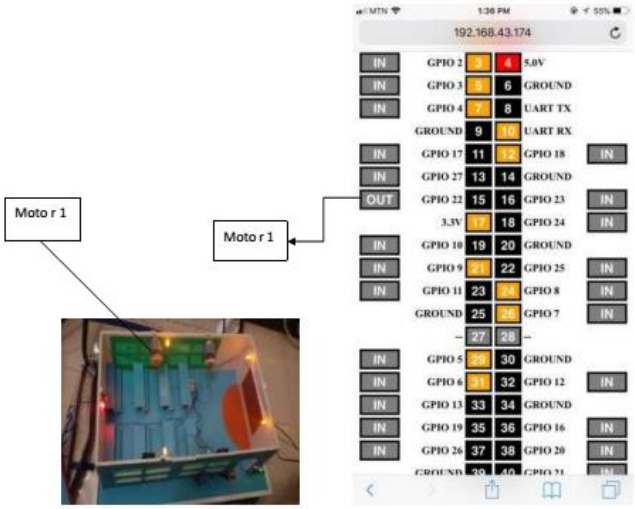

Fig.12. Motor 1.

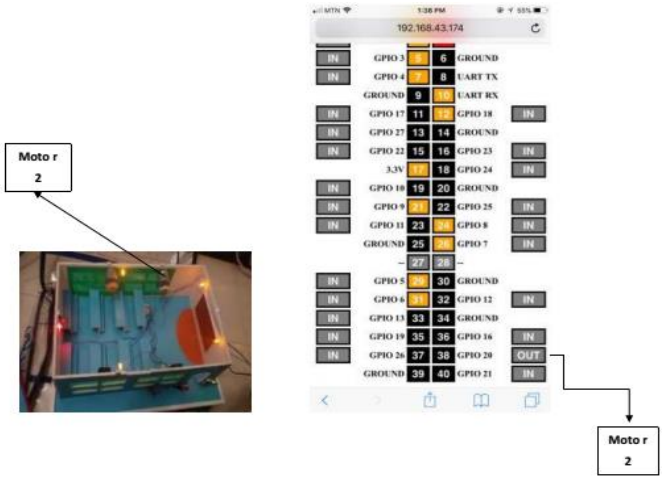

Fig.13. Motor2.

The control of motor1 and two accompled through key number twenty two and key number twenty respectivly. The door motor which used to open and close the hall by pressing key number twenty three as shown in Fig.14.

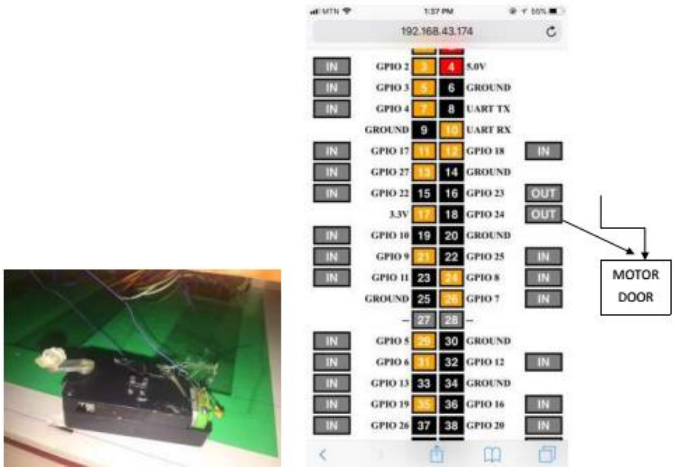

Fig.14. Door Control.

5. CONCLUSION

This paper introduced a design of smart college. The design is considered inexpensive and provides most of requirements that can be needed for classroom and can be generalized to cover all smart college requirements, the additional requirements can be added smoothly in few changes of programming and hardware. The access of the system can be either through smart phone or using Wi- Fi technology.

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