Basic Smart –Tech System for Small Scale Hotels and Guest Houses

Rida Siddiqui

Dept.of Computer Systems Engineering, Hamdard University, Karachi. Pakistan.

---***---

Abstract - We *live in a world of emerging new technologies making our lives more and more comfortable day by day. Some of these discoveries are new while the others are innovative use of the existing ones. This paper presents some conspicuous ideas to change the hotels to a "smart" platform. Hotel industries are greatly influenced by new technologies [1]. Technological Changes in accommodation sector have been focused in depth [1]. Future hotel rooms with new emerged technologies are the main concern for the hotel industries [1]. In this paper, some cost effective measures are discussed regarding customer's preferences, security and energy saving. As a result, the bottom line benefits of the suggested measures can be utilized by both, hotel management and their customers.*

Key Words: Door lock, Energy efficient, raspberry pi, hotel, android application.

1. INTRODUCTION

Since the world has become a global village, everything is turning to smart and feasible. Applying new technologies provides a platform for innovative and customize guest care[1] The prospective of new applications is inquired and assessed in "Smart Hotel"[1].This paper focuses on a cost-effective hotel management to provide unique and personalized guest experience and a proper energy management. Energy crisis have been upsurge dramatically in last few decades in underdeveloped countries like India and Pakistan and merits serious consideration. Moreover the apprehension of security and privacy of hotel customers is warranted and must meet the customer satisfaction. However this article highlights some solutions to the above stated stances.

2. Issues And It's Solutions

2.1 SECURITY CONCERN:

Security is among the most important factors which a customer don't want to compromise at. A survey of 930 hotel guests revealed that they showed willingness to pay more for better security[2].Security issues are the center of focus for both, guests and hotel managers[2] .For this purpose we have used a door lock system. This system uses an android application which is used for several purposes like room reservations, meal booking, housekeeping, bill payment and door lock codes. Java Development kit and software development kit were used for android app development [3].The code generation works in following sequence.be used. Other font types may be used if needed for special purposes.

Figure 1: The workflow of door lock code

The Hardware operation of the door lock is focalized on Arduino Mega 2560. Upon power on, the Lcd (16x2) displays "WELCOME" followed by "ENTER CODE". If the code entered is correct the door opens whereas if it is wrong the lcd displays "TRY AGAIN".
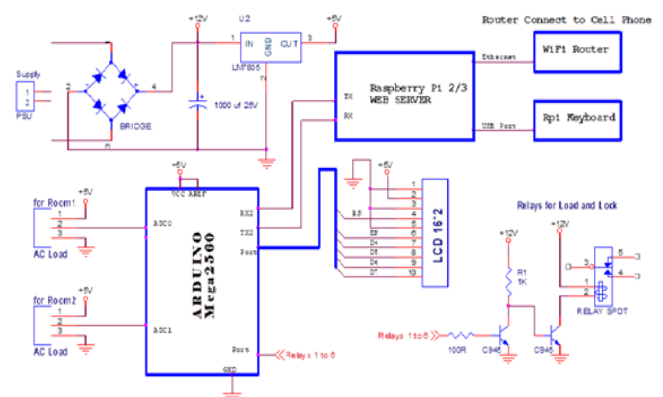

Figure 2: Circuit diagram of door lock

Power supply is installed to provide the required power/voltage to relay, Arduino and LCD display. We have attached it with a 12V transformer. AC voltage is converted into DC voltage by the bridge installed on the supply. Voltage regulators 7805 and 7808 are also on the power supply board, to give voltage to LCD display and Arduino. These regulators converts the 12V voltage into 5 volt and 8 volts volts respectively. 1000 micro farad is added for the filtration purposes.

We have used a keypad which is designed according to the 3x4 matrix. It is used to enter the door lock. 7 IO pins of Arduino are used with it. If we would not have used the matrix form, then more Arduino pins would have been utilized resulting into complex programming. The number pressed is recognized by the signals that is generated from the particular row and column.

A 12 volt SPDT (Single Pole Double Through) Relay has been used for switching. Its operating voltage is 12 volts 153mA [4]. We cannot operate it directly from the Arduino because its output current is 150mA so we have used a C945 transistor to increase the voltage supply of Arduino for the relay. The positive 12v are directly provided to the relay by the power supply and the negative volts are provided by Arduino and C945 transistor. C945 transistor is a NPN transistor. It has three legs i.e. emitter, collector and base. When we give positive signal to its base, it starts giving the signal which is present on the emitter to collector. The C945 transistor do the negative switching, hence we have grounded the emitter so that we get negative on collector, keeping the base positive (getting signal from Arduino). Two C945 transistors are used on the board and in between them we have also connected a PC817 which is an optocoupler. It consists of a transistor (phototransistor). When the relays work, they generate a back EMF which causes DC base distortion which is a cause of noise. This noise hangs the controller sometimes, so in order to isolate this noise we have used an optocoupler since it doesn't need a wire connection to work, back EMF is produced when we have direct connections from wire. And back EMF dc base distortion a led. The transistor opens when the led glows. This optocoupler requires 40mA. Hence, if the code is correct, the relay opens the door.

Figure 3 shows the flowchart which illustrates the sequential procedure that was followed in the program of door lock security
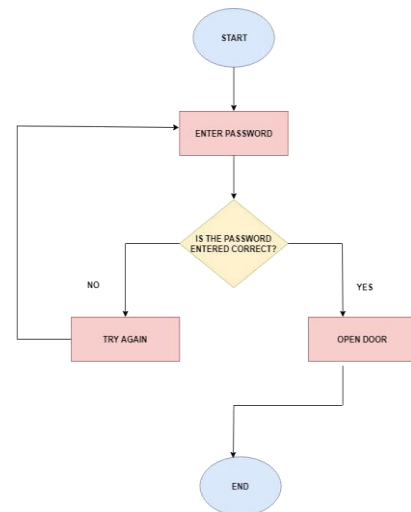

Figure 3: Flow chart of door lock programming

2.2 ENERGY CONSUMPTION:

Hotels are among the top 5 energy consuming sectors [5]. In order to contribute to "green" environment, energy saving is necessary. The factor presented in this article focuses on a programmable system. Tourists claim that they have to pay bills way more than their energy consumption and usage, therefore a system is designed through which the guests will indicate the appliances they want to use at the time of check in and the voltage will be provided to the room accordingly. This will benefit the hotel management also as the customers will keep a check on their usage and energy saving.

This is implemented using a LM358 and LM324 which is a Op Amp and works as a comparator in the project.
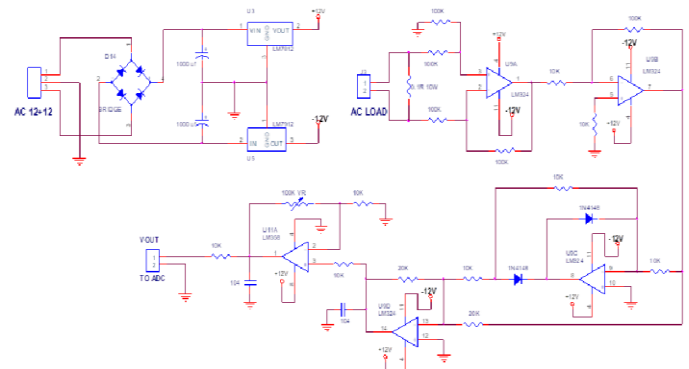

Figure 4: Circuit diagram of door lock

For this project the room required voltage was set to 100V. Further Load resulted in tripping of the power supply of the room. A shunt resistor is used and the voltage drop is obtained on LM324 IC which has 4 gates, and amplifies the result so that it can be noticed by Arduino. LM324 amplifies the result 10 times of the actual value, in this project converting 10mv to 100mv and the output was obtained on

LM358 which works as a comparator. The gain was set to 0.5 volts for 100V voltage supply.

WORKING OF LM358:

Non-Inverting Formula:

$A_v = 1 + (R_f/R_i)$ ---------------------------------   (1)

- ✓ **R_f =** Resistance feedback (ohms)
- ✓ **R_i =** Resistance Input (ohms)
- ✓ **A_v =** Voltage gain (V/V): volts per volt

Output for non-inverting opamp:

$V_{out} = A_v \times V_{in}$ ----------------------------------- (2)

Inverting OpAmp Formula:

$A_v = - R_f / R_i$ ------------------------------------- (3)

- ✓ **R_f =** Resistance Feedback
- ✓ **R_i =** Resistance Input
- ✓ **A_v =** Voltage Gain (V/V) : volts per volt

2.3 ROOM RESERVATION:

The use of internet in business world has become a prominent trend [6]. The internet as collection of networks provides a free communication [6]. More than 400 million computers and 400,000 networks are communicating with each other [6]. Therefore, internet is becoming a powerful platform for marketing and business [6]. This allows businessmen to have a better representation of their services and products [6]. This has helped customers to communicate with companies through this World Wide Web. [6].

This project uses an android application which can be downloaded easily on a smartphone. The customer can check the availability of the rooms and can book the room of their choice. This saves time of the guests as well as it's a big feasibility as they don't have to worry about their accommodation on reaching their destination. Moreover, through this app the customers can select meals of their choices, pay bill and get a door lock code on their phone.

3. RESULTS:

The project was implemented on two rooms. **Figure 6** shows the hardware implementation of the project.
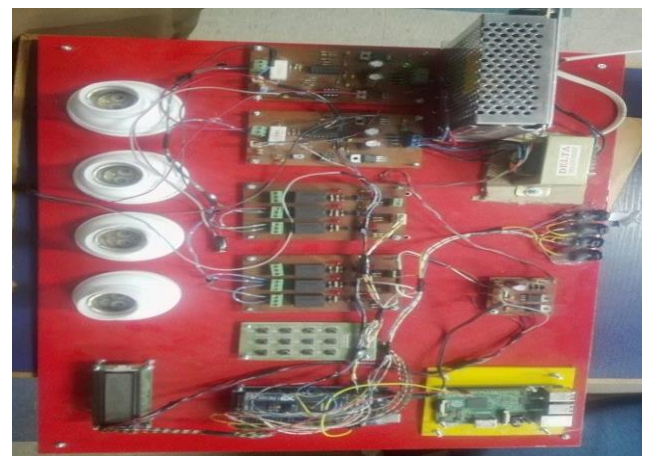

Figure 6: Hardware of the project

The picture clearly shows the raspberry pi, Arduino, LCD display along with the other components used. The boards with relays are used for door lock and voltage tripping. The other two boards are used for the comparison of voltage with the required room voltage.
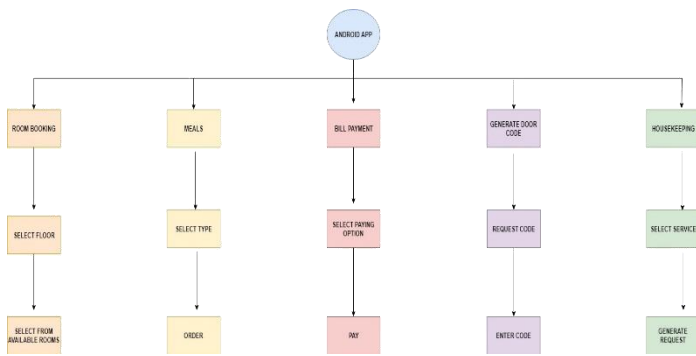
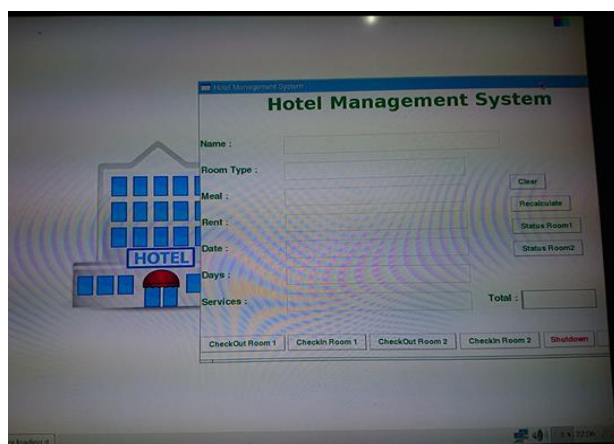Figure 7 and 8 shows the android app working of the project.

Figure 7: Room reservations

The picture above shows the room details which includes name of the customer, room type, meal, rent, date days and services. The details of the customer are who have booked the room are saved in firebase.

4. RECOMMENDATIONS:

The project under review offers a number of opportunities for future research and experimentation work. Here are some of the ideas and proposals which offer room for improvement and future work.

Firstly, the Mobile app which is of limited options can be extended to a variety of more options to give a personalized room experience to guests. Music option can be added to play the music of customer's choice when they enter in room. Moreover age limit can be added to the app so that children under 18 cannot do hotel bookings. For this purpose, ID card verification will be required before the booking. The door lock system can be implemented using Bluetooth as well. Room Temperature control feature can also be added, for this thermostats are used which works as a closed loop system. Voice controlled rooms can be another big turnout for the hotel market.

5. CONCLUSION:

This prototype system gives a cost effective idea to make small scale hotels and guest houses more comfortable, secure and convenient. This system is cheaper for the managers who don't want to invest much yet want to offer a lavish stay and quality services.

REFERENCES

[1] Klemens Waldhöra and Claudia Freidla," Acceptance of New Technologies in Hotel Rooms", aTourismus Research Center Krems GesmbH {klemens.waldhoer, claudia.freidl}@kremsresearch.at

[2] Julie Feickert, Gerhard Plaschka, Rohit Verma , Chekitan S. Dev," Safeguarding Your Customers: The Guest's View of Hotel Security", Cornell University School of Hotel Administration, The Scholarly Commons.

[3] Agbo David O., Madukwe Chinaza, Odinya Jotham O, "Design And Implementation Of A Door Locking System Using Android App", INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 6, ISSUE 08, AUGUST 2017 ISSN 2277-8616.

[4] https://www.instructables.com/id/All-You-Need-to-Know-About-Relays/

[5] Vlatko Cingoski and Biljana Petrevska, "Making hotels more energy efficient: the managerial perception", Pages 87-101 | Received 07 Apr 2016, Accepted 06 Dec 2017, Published online: 18 Jan 2018

[6] Glenda A. Delizo and Mischelle A. Esguerra, " Online hotel reservation and management system for the college of international tourism and hospitality management (CITHM). ISSN 22773061.