

Home Automation System Using Bluetooth

Bhagyajyoti¹, Immanuel J², L. Shrimanth Sudheer³

^{1, 2, 3}Department of Instrumentation Technology, Gulbarga University P.G Centre, Yeragera – 584 133. Raichur, Karnataka, India

Abstract: *In this paper an attempt is made to design smart phone based home automation system. The system is designed by using Intel microcontroller AT89C52 and Bluetooth device (HC05). The AC power devices in the home are connected to the system using relays. A Bluetooth enabled smart phone is paired with the HC05 which is interfaced with the microcontroller. The smart phone now acts like a remote assist device to communicate with the home appliances. The Home appliances are connected to the microcontroller through relays to provide mechanical isolation between the two. The relays are turned ON/OFF by sending commands from the smart phone. Each relay is connected to the particular home appliance there by the appliances can be turned ON/OFF. This system can also be connected to the computer and through computer the home appliances can be controlled by sending command from the computer.*

Keywords: Automation, HC05, AT89C52, Home Appliances, Relay

1. Introduction

Smart phone usually support one or more short range wireless technologies such as Bluetooth and infrared, making it possible to transfer data via these wireless connections. Smart phone can provide computer mobility, ubiquitous data access, and pervasive intelligence for almost every aspect of business processes and people's daily lives. One of the smart phone applications that have been developed is smart home technology. Smart home technology is the technologies that are used in homes with various apparatus converse over a local network. According to the Smart Homes Association the best definition of smart home technology is, the combination of technology and services through home networking for a better value of living. This technology can be used to monitor, alert and execute, according to the desired functions. Smart homes technology makes automatic connection with environment via Internet, telephone or regular fixed phones. Smart homes actually have the ability to make life easier and more proper. Home networking can also offer peace of mind. Whether you're at job or on holiday, the smart home will aware you to what's going on, and security system can be built to offer some help in emergency situations. For example, not only would a house owner be woken with warning of a fire alarm, the smart home would also turn off lights, Fans TV and motors.

The use of Bluetooth technology in a smart phone today is not just for the transfer of data and files only. In recent years, smart home automation is one of the applications of Bluetooth technology. Bluetooth technology operate over unlicensed, its available at 2.4GHz frequency, it also can link digital devices within a range of 10m to 100m at the speed of up to 3Mbps but it depending on the Bluetooth device class. The system is invented to be low-priced, scalable so that new devices can be simply integrated into the system, and it should be user friendly. A variety of smart systems have been considered where the control is via Bluetooth, internet, short message service (SMS), smart card based, WiFi etc., Shiva Kumar proposed smart home design application that allows owner to manage their home through internet. It need a PC tend the information to the internet, so a PC is used as a server that increases the price and power consumption while others need web page hosting that need extra cost also. The use of PC can require considerable cost and can be reduced by using a

microcontroller. Pawan Singh et.al., proposed a system which was user friendly and easy to use. The system was using Global System for Mobile Communication (GSM) modem to control home appliances via Short Message Service (SMS). The AT- Commands has been used in this system to control the devices. AT89s52 microcontroller was integrated with the GSM to give baud rate of 9600 bps. The range of GSM is global so the user can use the system from any corner of the world [1-3].

D.Naresh et.al., put forward the design of home automation and security system using ARM7 LPC2148 board. Home appliances were connected to the ARM7 and communication was established between the ARM7 and ARM9 with Bluetooth device. It presents the design and implementation of automation system that can monitor and control home appliances via ARM9 S3C2440A board [4-5]. R. A. Ramlee et.al., presents the overall design of Home Automation System (HAS) with low cost and wireless remote control. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation [6-8]. V. Sathya Narayanan et al., introduces the intelligent home automation system (IHAM) which was developed using PIC microcontroller with the ZigBee wireless communication technology, speech recognition technique and GSM network technology that control the home appliance. The paper also explains the security system for fire hazards that may occur through smoke sensor and GSM Module that was controlled by the same controller that sends the SMS to the user if the smoke was detected [9-10].

Mohamed Abd El-Latif Mowad et al., discussed design and implementation of a control and monitor system for smart house has been established. Smart house system (SHS) consists of many sub-systems that controlled by Microcontroller software as a main controlling system. Also, SHS was supported by remote control system as a sub- controlling system. The system is also connected to a wireless bluetooth technique to monitor and control the electronic house equipments from anywhere in the world using both Arduino and micro controller [11-13]. Laxmi Soni et al., proposed PC based control systems which were highly reliable, accurate and time saving systems. They provide number of features like quick data storage, transfer data and data securities which helps in

industries to work in sufficient manner [14-15]. P Pavan Kumar et.al., proposed the design of home automation and security system using Android ADK. The device with low cost and scalable to less modification to the core is much important. It presents the design and implementation of automation system that can monitor and control home appliances via android phone or tablet [16].

All research that mention above, inspired our research to make a research about the device that providing a safe and efficient solution for controlling home automation. The first step to build a smart home is about the security and electricity is the mayor device for home automation system.

The use of Bluetooth technology in a smart phone today is not just for the transfer of data and files only. In recent years, smart home automation is one of the applications of Bluetooth technology. In present market so many home automation systems are available with wired and wireless communication but they are of much costlier and cannot be upgraded with the existing systems. From the literature it is found that so many authors proposed the design of smart home applications, but their systems uses wired communication for the device control using pc and internet. Hence in this project an attempt is made to design microcontroller based home automation system by using Bluetooth and this system can be upgraded with the existing wiring, without altering it.

2. Block Diagram of the system

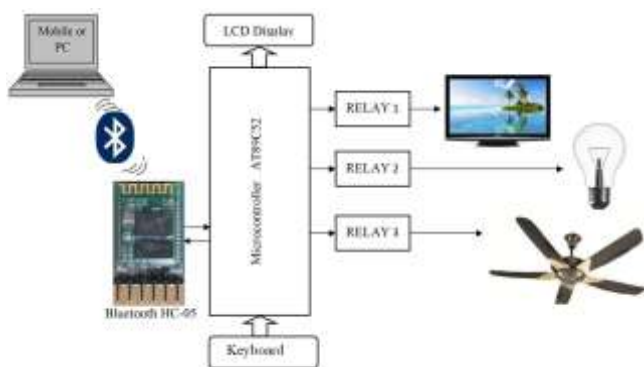


Figure 1: Block Diagram of the system

Fig 1 Shows the block diagram of the Home automation system. It consists of Microcontroller(AT89c52), Bluetooth module, and relays. The Bluetooth module is interfaced with the microcontroller through serial port. This system can be paired with the Bluetooth enabled devices. The microcontroller receives commands from the Bluetooth enabled devices and accordingly the corresponding relays are switched ON/OFF. Also the ON/OFF statuses of devices are also sends to the Bluetooth enabled devices and to PC.

2.1 Bluetooth (HC-05) Module and its Application.

HC-05 Bluetooth module is an easy to use Bluetooth SPP(serial port protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR(Enhanced Data Rate) 3Mbps modulation with complete 2.4GHz radio transceiver

and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mm*27mm.

2.2 AT89C52 Microcontroller

Microcontroller is a microprocessor with all peripheral devices fabricated in a single chip. It is known as an embedded system and single chip microcontroller.

Features of AT89S52:

- It is 8-bit microcontroller
- It is 8-bit CPU
- It contains 8k bytes of In-System Programmable flash memory
- Three 16 bit timer/counters
- It contains 256 bytes of internal RAM
- 32 Programmable I/O Lines
- Three-level Program Memory Lock
- Fully Static Operation: 0HZ to 33mhz
- 8 Interrupt Sources
- Full Duplex UART Serial Channel
- Watchdog Timer
- 4.0v to 5.5v Operating Range
- Dual Data Pointer
- Fast Programming Time
- Flexible ISP Programming(Byte and Page mode)

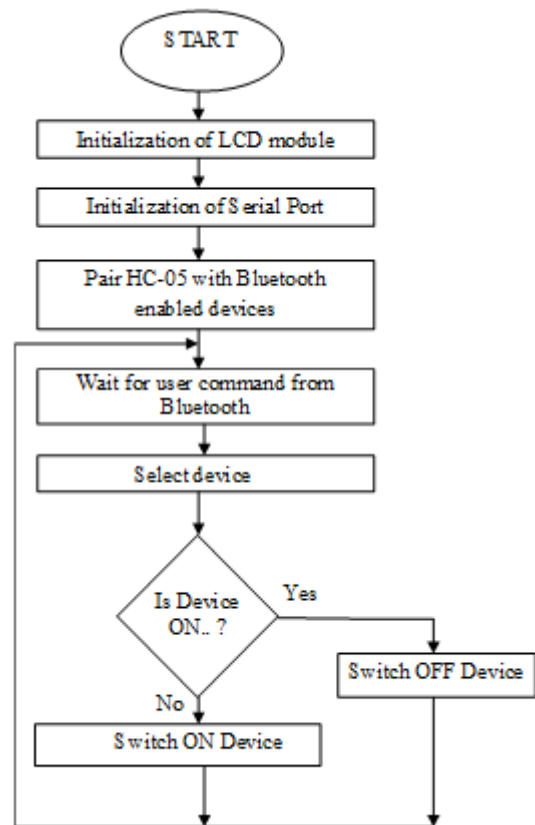


Figure 2: Flow Chart

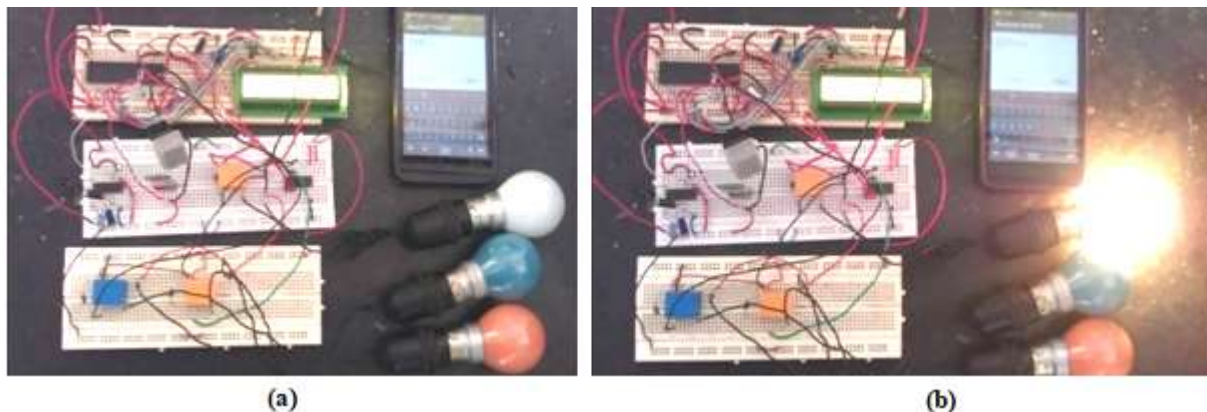


Figure 3: AT89C52 Microcontroller

2.3 MAX 232

The MAX232 is dual driver/receiver and typically converts the RX, TX, CTs and RTs signals. The drivers provide RS232 voltage level outputs (+/-7.5v) from a single +5v supply via on-chip charge and external capacitors. The MAX232 IC is used to convert the TTL/CMOS logic level to RS232 logic level during serial communication of microcontroller with PC. It will take input from controller's serial transmission pin and send the output to RS232 receiver. The receiver on the other hand, takes input from transmission pin of RS232 serial port and give serial output to microcontrollers receivers pin. MAX232 needs four external capacitors whose value range from 1MF to 22MF.

2.4 ULN2803 Current Driver

A ULN2803 is an integrated circuit(IC) chip with a high voltage/high current Darlington Transistor Array. It allows you to interface TTL signals with higher voltage/current lodes.

It is used to operate high voltage devices. EX: Relay Bulb, Fan, Motors, and Printers etc. Featuring continuous load current ratings to 500mA for each of the drivers, the series ULN28XXA/LW and ULQ28XXA/LW high voltage, high current Darlington array are ideally suitors for interfacing between low-level logic circuitry and multiple peripheral power loads. Typical power loads totalling over 260w (350 ma *8,95v) can be controlled at an appropriate duty cycle depending on ambient.

2.5 Relays & their interfacing with microcontroller

Relay is an electromagnetic device which is use to make or break a circuit. The simple explanation is a relay is an electromagnetic switch. When low power is sent to it, it makes a connection to send power to light, electric motor, etc.

A relay is usually an electromechanical device that is actuated by an electrical current. The flowing in one circuit causes the opening or closing of another circuit. A relay is an electrically operated switch. Many relay use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid state relays. Relay are used where it is necessary to control a circuit by a low power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph

circuits as amplifier: they repeated the signal coming in from one circuit and re-transmitted it on another circuit.

2.6 Working of the System

A Bluetooth module is interfaced with the microcontroller through standard serial communication protocol. When the Bluetooth module is powered on it is visible to the Bluetooth enabled devices and can be paired. From the paired device the command is sent to the Bluetooth module (HC-05). The microcontroller receives the command from the Bluetooth module which is sent by the paired device, either it may be PC or phone. The received data is decoded and obtained numeric information. The AC appliances such as FAN, LIGHT, and TV can be interfaced to the microcontroller through relays. The relays are interfaced with the microcontroller and driven by the current driver ULN2003. By the obtained numeric information, the devices are made either switch ON/OFF by sending appropriate command to relays. Once the Bluetooth module is paired with the any other device the process is repeated for the same. The system also sends the devices status information to the PC. In the HyperTerminal the status is displayed. Fig 2 shows the flowchart of the system.

3. Result and Conclusion

The Microcontroller based home automation system using bluetooth is designed and constructed. The three AC devices are controlled (ON/OFF) from the system. The command to switch ON/OFF the devices is shown in below table,

Table 1: Devices Status & Control Commands

Devices	Command	Device Status	Resultant
BULB 1	1	ON	OFF
		OFF	ON
BULB 2	2	ON	OFF
		OFF	ON
BULB 3	3	ON	OFF
		OFF	ON

In fig3 (a) & (b) the Bluetooth module is paired with the mobile and command '1' is sent to the module, bulb 1 is ON. Same way by sending command '1' the bulb 1 can be made OFF. From the experimental results it is concluded that the Microcontroller based home automation using Bluetooth is working satisfactorily.

References

- [1] Pawan Singh, Krupa Chotalia, Sanket Pingale, Sandhya Kadam "A Review Paper on Smart GSM Based Home Automation System" International Research Journal of Engineering and Technology Volume: 03 Issue: 04 Apr-2016 pp 1838-1843
- [2] C. Gomez and J.Paradlls, "Wireless home automation networks: A survey of architectures and technologies, " IEEE Communications Magazine, vol.48(6),pp.92-101,Jun.2010
- [3] J. Walko, "Home Control," Computing & Control Engineering Journal, vol.17 (5), pp.16, 19 Oct-Nov 2006.
- [4] D.Naresh, B.Chakradhar, S.Krishnaveni "Bluetooth Based Home Automation and Security System Using ARM9" International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 9- Sep 2013 pp 4052.
- [5] N. Sriskanthan and Tan Karand."Bluetooth Based Home Automation System". Journal of Microprocessors and Microsystems, Vol. 26, pp.281-289, 2002.
- [6] R.A.Ramlee, M.H.Leong, R.S.S.Singh, M.M.Ismail, M.A.Othman, H.A.Sulaiman, M.H.Misran, M.A.Meor Said "Bluetooth Remote Home Automation System Using Android Application" The International Journal of Engineering And Science Volume 2 Issue01 PP 149-153, 2013.
- [7] Sandeep Kumar & Mohammed A Qadeer, "Universal Digital Device Automation and Control", in IEEE, 2009, pp. 490-494.
- [8] Hiroshi Kanma, Noboru Wakabayashi, Ritsuko Kanazawa & Hirimichi Ito, "Home Appliance Control System over Bluetooth with a Cellular Phone", in IEEE, 2003, pp. 1049-1053
- [9] V. Sathya Narayanan, S. Gayathri "Design of Wireless Home automation and security system using PIC Microcontroller" International Journal of Computer Applications in Engineering Sciences Volume III, Special Issue, August 2013 pp 135-140.
- [10] Usha Devi, "Wireless Home Automation System Using ZigBee ", International Journal of Scientific & Engineering Research Volume 3, Issue 8, August-2012.
- [11] Mohamed Abd El-Latif Mowad, Ahmed Fathy, Ahmed Hafez "Smart Home Automated Control System Using Android Application and Microcontroller" International Journal of Scientific & Engineering Research, Volume 5, Issue 5, May-2014 pp935-939
- [12] Hsien-Tang Lin" Implementing Smart Homes with Open Source Solutions" International Journal of Smart Home Vol. 7, No. 4, July, 2013.pp 289-295.
- [13] Roslin John Robles and Tai-hoon Kim "Applications, Systems and Methods in Smart Home Technology: A Review" International Journal of Advanced Science and Technology Vol. 15, February, 2010.pp 37-47.
- [14] Laxmi Soni, Sarika K. Thorat And Sandeep Chawda "PC Controlled Home Appliances" Int. Journal of Engineering Research and Applications Vol. 4, Issue 5(Version 1), May 2014, pp.51-53
- [15] Inderpreet Kaur, "Microcontroller Based Home Automation System With Security", International Journal of Advanced Computer Science and Applications, Vol. 1, No. 6, December 2010.pp 60-65
- [16] P Pavan Kumar, G Tirumala Vasu "Home Automation & Security System Using Arduino Android ADK" International Journal of Emerging Trends in Engineering Research (IJETER), Vol. 3 No.6, PP 190- 194 (2015)

Volume 7 Issue 4, April 2018

www.ijsr.net

[Licensed Under Creative Commons Attribution CC BY](#)