

Controlling Home and Office Appliances with the Bluetooth of Smartphone

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ABSTRACT

Remote control for appliances at home and office based on smart phone is more useful for the users that equipped with special facilities to enable occupants to control home electronic devices, including televisions, fan, light switches, cameras, air-condition. It used to provide convenience for user to remotely control the appliances and it provides a better use of electricity. The efficient use of electricity makes the home automation to play an important role in daily life. All smart phones come with the ability to communicate over the cellular networks, and built-in short-range communication capabilities, such as Bluetooth, that could allow them to communicate and control appliances in their surrounding environment.

Developing a proposed system with low cost that allows users to interact with appliances. A proposed system includes a microcontroller (AVR) ATmega8 configured with CVAVR software and Bluetooth sensor to connect with the Bluetooth of smart phone by using application software installed in the smart phone. To access the control unit, the user should send a number from the software application to the framework that use to turn on /off the device. This article describes in detail, the design and implementation of the control system.

Keywords

Appliance control system, AVR atmeg8, Bluetooth sensor, smart phones, Remote control.

1. INTRODUCTION

Smart home is a home equipped with special facilities to enable occupants to control home electronic devices, including televisions, fan, light switches, cameras, air-condition. It used to provide convenience for user to remotely control and monitor the appliances and it provides a better use of electricity. The efficient use of electricity makes the home automation to play an important role in daily life. All smart phones come with the ability to communicate over the cellular networks, and built-in short-range communication capabilities, such as Bluetooth, that could allow them to communicate with and control appliances in their surrounding environment. Our main idea focus to control the home appliances from the Bluetooth of the smart phone, which used as a remote control and made the controlling of home appliances simple.

[1] The Author proposed a system to control home appliances used infra-red remote controller and power line communication by developing a home based server, this system help user to check the status of their appliances form anywhere through the cellular network and internet.

[2] Proposed a system that used a PC to convert voice command to txt than transmit this command via a user mobile to a cellular network, by the cellular network the mobile receive the SMS message which is read by the microcontroller, the communication medium between the microcontroller and mobile is RS232 standard. When completed the reception of the command the controller perform the action.

[3] The Author proposed two approaches for controlled home appliances. One to make a custom build controller from scratch for controlling the home appliances using wired connection. The main problem was that the connections of this controller clumsy as well as not reliable. X10, Insteon, Z-Wave and ZigBee were the available candidate for the home controller manufacturers. The authors left the home appliances controlled part to the X10 and concentrated on the communication between the mobile phone and the X10 controller for remote controlling of the X10 controller. They choose X10 over others due to its wide availability.

[4] Proposed a system in which the client system is programmed with an application which is used to control and monitor the appliances, the application that is developed for the client system is convert the given voice command to the symbolic data that is to be transferred via WI-FI network to the server computer. The server computer contains the Speech recognition application developed in Microsoft Visual Basic.net. so as the communication establish between the client system and the server it start the speech recognition and when the given data is received this is transfer to the control circuit via PC parallel port and the given load is switched on.

[5] Explained how the users control their home appliances and systems from remote, used a cell phone-based interface. The user send an authentication code (DTMF) along with the required function to his/her home control system via Global System for Mobile communication (GSM). Upon being properly authenticated, the cell phone-based interface at home (control unit) would relay the commands to a microcontroller that would perform the required function, and return a function completion code that would be sent to the source of the original command (user's cell phone).

[6] Proposed a GSM based system for controlling the Appliances for the people who are not at home, this is done remotely through SMS over GSM network using AT commands and on receiver the GSM modem is interfaced with the PC, the home appliances control system is developed on the PC to monitor and control. In the proposed solution they use PC parallel port which is further interfaced with the rely circuit to provide control over the appliances. This system also provides a feedback by simply SMS to user which also helps when there is any security breach in the home.

[7] The Author discusses two different approaches to control the home appliances, timer option and voice command. The first one provides control based on timer, and the second one use voice command to control the appliances. This system uses a PC and PC parallel port with software interface is developed on the VB 6.0 to convert voice command to text and provide the operation to control and monitor the appliances.

[8] The author proposed a system used Arduino and a GSM module, which forms the server side of the system. The Arduino work as embedded control applications. Therefore, it

managed on the software side; this ensures lower component size and increased system reliability. A customized message system that communicated with a smart home, electrical gadgets via a GSM interconnection with a SIM card. A prototype of system carried out successfully. With this system, multiple appliances could be switched OFF or ON simultaneously at a time.

[9] The Author Deals with the application of the Dual tone multi-frequency (DTMF) technology used in telephones and mobile communication. Used a DTMF decoder along with a microcontroller (arduino) to control appliance from a remote location.

2. PROPOSED SYSTEM

The proposed system consist of the following:-

2.1 AVR microcontroller

A microcontroller has a CPU (a microprocessor) in addition to a fixed amount of RAM, ROM, I/O ports, and timer are all embedded together on one chip. Therefore, the designer cannot add any external memory, I/O or timer to it. The fixed amount of on-chip ROM, RAM, and number of I/O ports in microcontrollers makes them ideal for many applications in which cost and space are critical.

ATmega8 provides 23 general purpose I/O lines, 8 Kbytes of System Programmable Flash with Read-While-Write capabilities, 512 bytes of EEPROM, 1 Kbyte of SRAM, and a serial programmable USART.

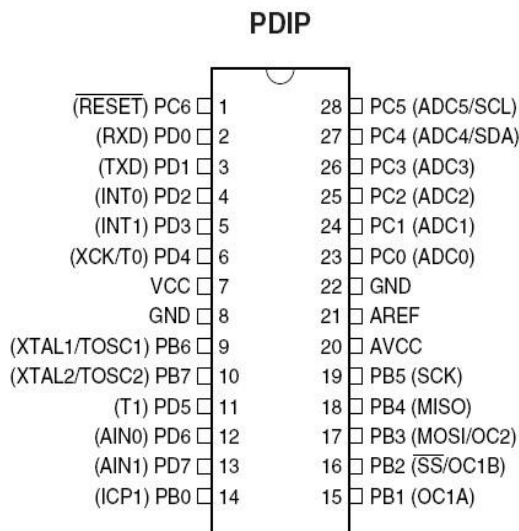


Fig 1: AVR microcontroller (Atmega8)

2.2 CVAVR

Using Code-Vision-AVR to be the best IDE (Integrated Development Environment) for getting started with AVR programming on Windows 7. It has a very good Code Wizard which generate codes automatically. You can download evaluation version for free which has code size limitation but good enough for our purpose.

2.2 Bluetooth Sensor

Bluetooth is a wireless technology that allow to exchange data over short distance. Bluetooth sensor is a sensor that use to detect the data which sent from the smart phone to the microcontroller.

HC-06 Module communicates with the AVR microcontroller via four pins

VCC -> VCC is used to power the module

GND -> GND is the ground pin.

TX -> TXD is used to send data from the module to the AVR microcontroller.

RX -> RXD is used to receive data from the AVR microcontroller.



Fig 2: HC-06 Bluetooth Module

2.3 Relay

A relay is a switch that operate electrically which use an electromagnet to operate mechanically. A relay has DC input to receive a signal and AC output to operate devices, when the relay receive a signal from the AVR microcontroller port it well connect the common port to (NO) port which connected with the AC device. By using the relay it is possible to operate any device when receive a right signal.

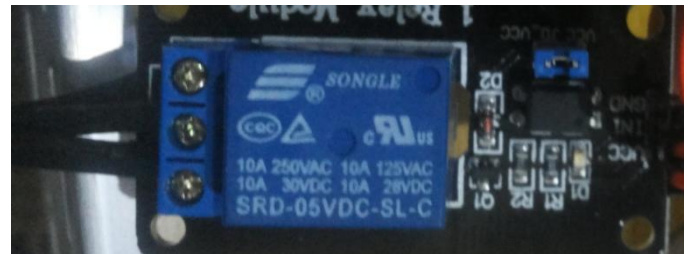


Fig 3: Relay 5V

2.4 BTInterface

BT Interface is a software installed from the play storage of the smartphone that provide interface to connect by Bluetooth with the platform. This software is easy to install in the smart phone by any user and do not need to provide with a remote control to controller the devices jut send a number from this software which received by the Bluetooth sensor to turn on/off the devices.

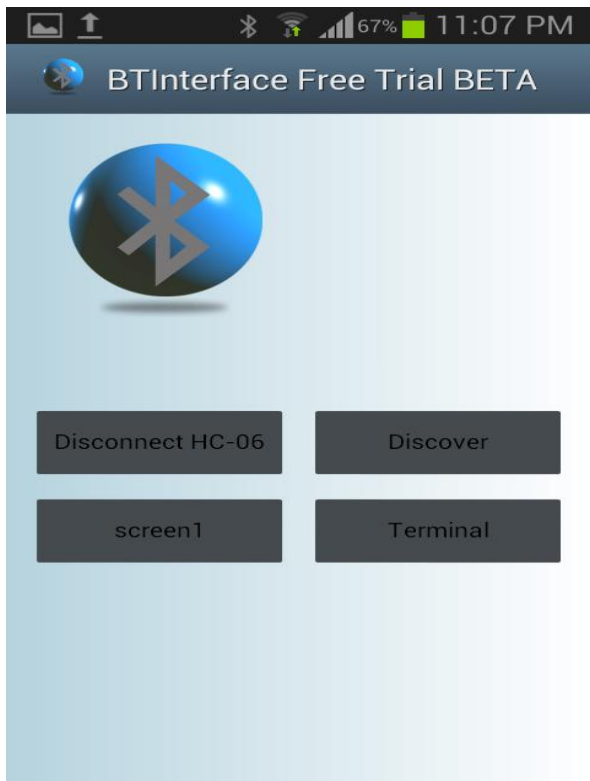


Fig 4: Bluetooth interface in smart phone

3. RESULT AND DISCUSSION

At the first time configure the AVR (Atmega8) microcontroller using CVAVR software which include the following steps

- 1- USART to receive the signal from the Bluetooth of the smart phone.
- 2- Configure the LCD display to display the cases of devices.
- 3- Configure the Ports for the Output cases which depend on the number received from the smart phone.

When the configuration processes done the microcontroller connecting as the follows

- 1- Connect HC-06 Bluetooth module Rx to Tx of the microcontroller and Tx of HC-06 Bluetooth module to Rx of the microcontroller than complete VCC to VCC and GND to GND.
- 2- PortB.1 for example to Relay
- 3- Relay to AC device
- 4- After the power up of Bluetooth device turn on the Bluetooth in android phone
- 5- Search for the devices. HC-06 is found.
- 6- Type the password (1234).
- 7- Press terminal key as shown in fig (4) and print the number that used in the configuration of the microcontroller for example number 1 to turn on the light and number 2 to turn of the light as shown in figure (5)

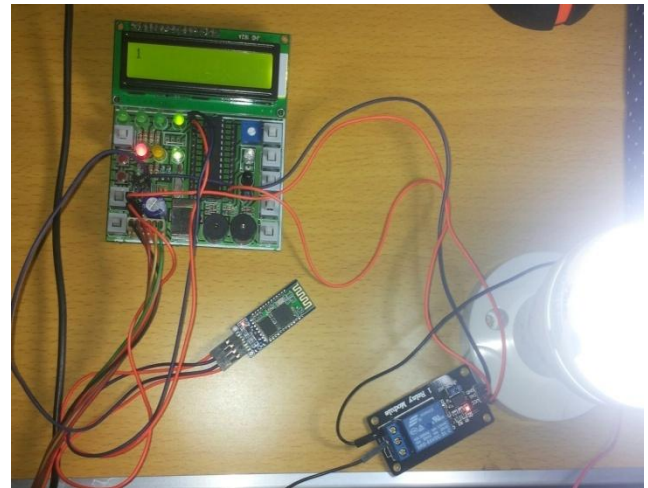


Fig 5: Test the working of the proposed system

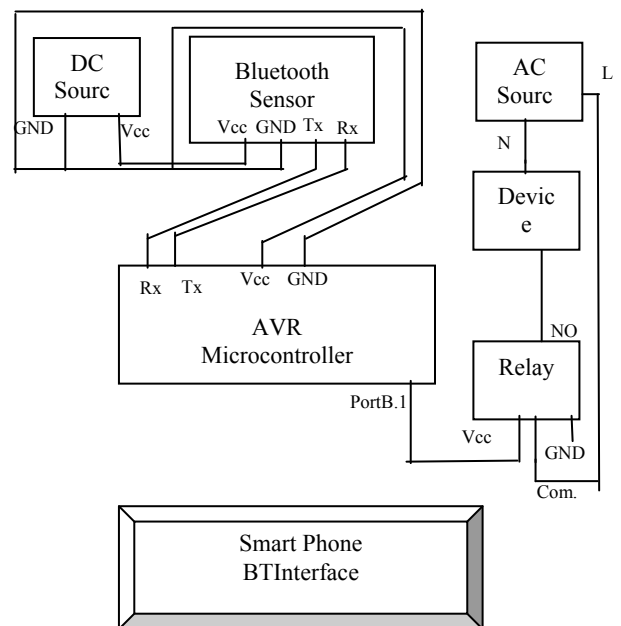


Fig 6: show the proposed system design

Than with using this proposed system it is easy to control all devices in the office or room by the smartphone and also use this smart phone to communicate through the cellular network.

The benefit of using the proposed system is to reduce the power consumption by easy controlling the home or office appliances and also the cost evaluation of this proposed system will be reasonable and with the smart phone more thing will be very easy like appliances controlling, calling, internet browsing...etc.

4. CONCLUSION

In this paper a proposed system has been designed using AVR atmega8 microcontroller and controlled by the Bluetooth of smartphone using BTInterface application.

The performance of the proposed system has been tested and it is very comfortable to the occupant for easy control the home or office appliances via the Bluetooth of the smartphone when the user in the remote area and in the same time the smartphone using for calling, internet, games, that's mean in the future the mobile phone using to control more and more thing also this design is very simple and the cost is low.

In the future scope it is useful to design an application that contain the names of appliances installing in the smartphone to make the controlling more easily without confusing and the proposed system manufacturing by a company supported by this application.

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6. REFERENCES

- [1] Tam Van Nguyen, Dong Gun Lee, Yong Ho Seol, Myung Hwan Yu, Deokjai Choi, "Ubiquitous Access to Home Appliance Control System using Infrared Ray and Power Line Communication", ICI 2007, 3rd IEEE/IFIP International Conference in Central Asia, Tashkent, Uzbekistan, vol 1, pp1-4,26-28 Sept.2007
- [2] N.P.Jawarkar, Vasif Ahmed and R.D. Thakare. "Remote Control using Mobile through Spoken Commands". International Journal of Computer Applications (0975 – 888) Volume 48 – No.17, June 2012 4IEEE - International Consortium of Stem Cell Networks (ICSCN) 2007. 22 - 24,Pp.622 - 625, 2007
- [3] Rifat Shahriyar¹, Enamul Hoque², S.M. Sohan³, Iftekhar Naim⁴, Md. Mostafa Akbar⁵ & Masud Karim Khan⁶, "Remote Controlling of Home Appliances using Mobile Telephony", International Journal of Smart Home. 2008.
- [4] Mardiana B., Hazura H., Fauziyah S., Zahariah M., Hanim A.R., Noor Shahida M.K., "Homes Appliances Controlled Using Speech Recognition in Wireless Network Environment," ICCTD, vol. 2, pp.285 - 288, 2009 International Conference on Computer Technology and Development , 2009
- [5] C. K. Das, M. Sanauallah, H. M. G. Sarower and M. M. Hassan, "Development of a Cell Phone based Remote Control System:an Effective Switching System for Controlling Home and Office Appliances", IJECS-IJENS. December 2009
- [6] Malik Sikandar Hayat Khiyal, Aihab Khan, and Erum Shehzadi "SMS Based Wireless Home Appliance Control System (HACS) for Automating Appliances and Security". Issue in Information Science and Information Technology Vol 6., Pp 887- 894, 2009
- [7] Faisal Baig, Saira Beg, Muhammad Fahad Khan, "Controlling Home Appliances Remotely through Voice Command", nternational Journal of Computer Applications, 2012.
- [8] C.G. Onukwugha & P.O. Asagba, "Remote Control of Home Appliances Using Mobile Phone A Polymorphous Based System" African Journal of Computing & ICT. 2013
- [9] Murali R, Johny Richards R, Manoj Ramesh Rao, "Controlling Home Appliances Using Cell Phone", JSTR.2013.