

# Home Automation System via Internet using Android Phone

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**Abstract:** *In this process of Home Automation System via Internet using Android Phone, the demonstration of the strategy which makes every local home appliance to incorporate the working of lighting installations, fans, music systems, washing machines and dryers, doors and ventilation system is totally initiated and controlled by using the Arduino Ethernet web server and advanced Android smart phones. This technology allows: 1. designing embedded machine based remote tracking gadget using a cell phone at low value. 2. Far flung tracking is applied in any cell phone model in order to deliver flexibility. 3. At times when messaging fails, the mechanism for communication incorporates the opportunity.*

**Keyword:** Automation, Internet, Arduino Ethernet web server, Android smart phone, Advanced home automation

## 1. Introduction

The activity of the home or household things is automated by the latest technology, which is known as 'home automation'. The home appliances such as lighting, fans, appliances and other such systems may come under the control of this home automation technology, which results in providing more convenience, comfort, security and power saving. Yet, there is no one solution in the market has broken the mainstream of this technology, even when this concept has evolved and came through many decades and also such products were available in the market for a long time. The most need for the present generation homes is that the electronic machines are best controlled by automation method, resulting in making the life so simple. This technology is considered to be a gift for the elderly and physically disabled individuals, since they don't need to move from one place to another for just switching on/off the home appliances, opening or closing the door, and so on. This made such individuals live free from stress. This concept serves as an interface connecting home appliances to automation system, via the internet, thereby providing control and monitoring all the procedures happening via a smart phone or a web browser. The home mechanism has now got the enough revolutionized edge since this technology is well combined with the advancements of smart phones and tablets. The smart phones are now becoming the most highlighted device of such technology and also initialize other such gadgets to utilize the Bluetooth technology to the fullest. With the arrival of latest technology associated cellphones, a noteworthy improvement has been seen in the mobile application field.



Figure 1: Home Automation

## 2. Literature Survey

### 2.1 Advance Home Automation Using FPGA Controller

A new technology with Field Programmable Gate Array (FPGA) controller, Bluetooth and Android phones which is a wireless technology was introduced by the author in this page. A Xilinx Spartan-3E uses VHDL language. V means VHSIC (Very High Speed Integrated Circuit). Based on Basys2 development board FPGA Controller is designed. Number of home appliances can be. Connected to FPGA which has a many input and output pins. Home appliances are also controlled by FPGA. For monitoring equipment by wireless technique, Bluetooth has been used. For speech recognition Android phones have been used. FPGA is connected with DC motor, stepper motor, a LED. When compared to FPGA Controller, a micro controller has less number of input and output pins than the FPGA Controller. Increasing the speed using parallel communication is the main aim of this paper.

## 2.2 GSM Based Home Automation System Using App-Inventor for Android Mobile Phone

Home automation based on GSM system using App-inventor for Android mobile was introduced by the author of this paper. Designing different blocks than design the source code like in Lab VIEW software is the duty of programmer in App inventor. This means that programming is not an essential thing. Making ease in programming using App inventor and security using GSM is the main aim of this paper. Designing a new smart phone apps using Android is a platform of App inventor. Before proceeding to start designing both part the screen objects (Designer) and the programming logics (blocks) a user has to login first online. Using GSM user can control home appliance by each corner of world. ULN2803 octal peripheral driver array, ATMEGA328 Arduino board with microcontroller, GSM Modem, Relay and some other small components are used in the hardware. As like a transceiver the Arduino board works here. 23 I/O lines are there in this system. Hardware and software part is done individually in this paper.

## 2.3 Android Based Appliances Control System:

Controlling fan speed and light intensity which is the specialty of the project is well explained in this paper. Two parts, hardware part called process unit and software part called monitoring unit are clearly explained in this paper. Bluetooth module LM400, LCD, dimmer circuit, and microcontroller PIC16F877 (40 pin IC) are the units which totally comprises of the process unit. Smart phone is the only device used for monitoring. Dimmer circuit is designed using SCR is designed for better efficiency. Android phone which has Bluetooth application are used to control home appliances. For communication Bluetooth module is used. It is wireless technology. Controlling the fan speed and intensity of light, dimmer circuit is used.

## 2.4 Bluetooth Based Home Automation and Security System Using ARM9

The two microcontroller development boards viz ARM 7 and ARM 9 were used in this paper. ARM 7 (LPC2148) is in receiver side and ARM 9 (S3C2440A) is in transmitter side. For designing the application on ARM9, Operating system Wince6.0 is used. ARM7, ARM 9, ULN2003, Relays, Bluetooth module are used in the hardware parts. For designing apps VB.NET is used. In software part Graphical User Interface module and Serial Port Profile modules are used. Bulb, fan is controlled the usage of Bluetooth, ARM – MDK kits acts as a processor. Its miles price effective assignment.

## 2.5 Efficient Interactive Control System based on GSM:

GSM technology with AT89S52 microcontroller was introduced by the author of this paper. Embedded C programming makes use of simulation software is Proteus v7.7 and Keil compiler. If in future any accident will happen then system will send SMS messages to the user, is the prime aim of this project. User can send request for condition of system at any time. By using SMS service home appliances can be controlled which means GSM so user can

save his/her money and time. In proposed system, power supply gives 5V power to the system. Conversion of signal uses MAX232. All the relays which are connected to the loads are driven by the relay driver ULN2003. Last but not the least by using AT command GSM module SIM300 is messenger between the user and microcontroller. All the detail information about circuit diagram in Proteus simulation diagram and all necessary components are explained in a good manner in this paper.

## 2.6 RTOS Based Home Automation System Using ATMEGA

Home automation system using ATmega328 controller with RTOS (Real Time Operating System) was introduced by the author of this paper. the hardware components of this project consists of Blue-tooth module-JY MCU BT HC-06, Microcontroller -ATMEGA 328, LM35 Temperature Sensor, Liquid Crystal Display, Real Time Clock DS1307, and Relay Board. The specification of ATmega328 microcontroller is 14 Digital, 6 Analog I/O pins, Open-Source single-board. The specification of Blue-tooth module (JY MCU BT HC-06) are Supply voltage - 3.6 to 6V DC, I/O - 5V tolerant, Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps, Bluetooth SPP (Serial Port Protocol). The specification of RTC (DS1307) is Serial real time clock, I2C serial interface, 2 Automaticswitch circuitry and power fail detect, Programmable square wave output signal. Cost effective and more secure of home automation system is provided this system.

## 2.7 Comparative Analysis

From above surveyed papers, the entire home control automation device uses wireless technology. Smartphone performs a completely critical function in these kinds of structures. GSM technology is used in systems. (ATMEGA328) Arduino Board, (AT89S52), FPGA Controller, ARM7, ARM9, PIC16F877 (forty pin IC) and many others,acts as a controller in above domestic automation device. For driving the relays ULN2003 is utilized in almost all machines. In programming Xilinx Spartan-3E for FPGA controller, App inventor embedded C, Keil Compiler, VB.net etc. this all software's are used. Bluetooth modules LM400 having distance a hundred meters, frequencies 2400Hz, velocity three Mbps.

## 2.8 Related Literature Survey

For more than a decade, the term smart home is really not a new term for the science society. The sector of home automation is increasing vastly, as electronic technologies are advancing. Recently many smart systems have been designed which can be controlled via Bluetooth and Internet. Most of current laptop/desktops, tablets, notebooks and cell phones have built-in adaptor of Bluetooth that will indirectly reduce the cost of the system. So it can be considered as the Bluetooth capabilities are good. Most other systems are not so feasible to be implemented as low cost solution with implementing Bluetooth, since it limits the control to within the Bluetooth range of the environment. This leads to the Wi-Fi based home automation system to be presented. In this concept, the connected home devices are controlled and

managed by a PC (with built in Wi-Fi card) based web server. A wide range of home automation devices like fans, lights, and other home appliances are well supported by this system. The actions are coordinated by the home agent running on a PC, which is well proposed by a similar architecture. Internet controlled systems consisting of a web server, database and a web page of websites for interconnecting and handling the devices are also other such papers presented. A direct increase in cost and power consumption will be the result when these systems utilize a PC. The development and hosting of the web page will also costs high, on the other side. Using of Web services, Simple Object Access Protocol (SOAP) and Representational State Transfer (REST) as an interoperable application layer to remotely access home automation systems introduced a smart home management scheme over the Ethernet network based on XML SOAP standards few researchers have also presented lately. It is hard to handle SOAP based Web a service and adds overhead to the client and server when parsing the message, resulting in slow operation and higher Bandwidth and this is the disadvantage of using SOAP based Web a service. Web techniques such as HTTP (Hyper Text Transfer Protocol) caching and push messaging technique which is used for controlling household which has been represented by REST as a Web-based interaction. In order to manage the home devices, a Web-based graphical user interface has also been developed. Home appliances can be remotely controlled by 'appliance control subsystem', whereas the remote security monitoring is provided by the security alert subsystem. Users were able to control various lights and appliances within their home, using home automation using Cloud computing has also been proposed. According to the user's needs and requirements, the system is capable enough to instruct user via SMS from a specific cell number to change the condition of the home appliance. The system permits automated generation of SMS for that reason alerting the consumer in opposition to security risk, is the second element is that of protection alert that is done in a way that on the detection of intrusion. The life-style of all consumer companies in particular to the disabled and aged human beings in term of protection and comfortable can be helped and progressed by the integration of Bluetooth and Wi-Fi technology in Controlling home appliances. In the designing a smart home system the implementation of combined wired and wireless systems would be of most sensible, specifically in slicing the system's installation cost for conventional home. Additionally, after the emergency alarm has started, the monitoring system can also answer the call automatically. Tremendous contributions in home are made by the all above mentioned systems.

### 3. Research Methodology

This task consists of elements: hardware implementation and software program development.

#### 3.1 System Design

This project utilizes two types of communication: wireless and wired. A Bluetooth module referred to as CytronBlueBee is used to allow the controller to wirelessly speak with an Android phone. The house appliances are

physically linked to the controller thru relays. A signal is dispatched to the controller by way of Android phone. The received indicators methods and controls the house equipment for this reason. At the same time, the fame (ON/OFF) of the home equipment is dispatched to the Android telephone by way of the controller.

#### 3.2 Hardware Implementation

The implementation of the controller is clearly described in this section. By using an Arduino Mega2560-R3, CytronBlueBee, logic converter, relays and other electronic components integrate the controller. There are four components used in this project. They are:

- Arudino Mega2560-R3.
- CytronBlueBee.
- Single Pole Double Throw Relay 0-5V.
- Logic Converter four Channels.

#### 3.3 Electronic Circuitry Design:

All the components are connected together by electronic circuitry to perform tasks. By integrating several components, such as an Arduino Mega2560-R3, CytronBlueBee, logic converter, relays and other electronics components a controller is designed. To ensure the controller is functioning well, it is must that these components need to be well connected. The controller is divided into two parts: input and output.

Till a Bluetooth connection is installed and receives the data sent from the Android phone, the input element constantly listens to the incoming connection. Through a logic converter CytronBlueBee is connected to the Arduino Mega2560-R3. The logic converter is needed due to the fact CytronBlueBee and Arduino Mega2560-R3 operate in one of a kind voltages: 3.3V and 5V, respectively.

The output controls the home appliances as soon as the statistics from the Android phone has been processed. The home equipment is related to the Arduino Mega2560-R3 thru relays. The relay isolates the low voltage circuit (5V) from the high voltage circuit (240V). It really works as an electromechanical switch to activate/off the home equipment. The transistor is used to trigger the relay. Green LEDs are used to signify that the signal has been dispatched to the output pin after it's been processed.

#### 3.4 Software Program Development:

This section describes Arduino programming and androidsoftware improvement. The controller is programmed in Cthe use of Arduino IDE. The Android application is advanced in Java programming using Eclipse IDE.

#### 3.5 Arduino Programming

The baud rate of Arduino Mega2560-R3 is set to the baud charge of CytronBlueBee that's 9600 the use of the Serial. Begin ( ) characteristic. 4 virtual pins (46, 48, 50, 52) are assigned as the output pins using the pinMode( )function. The serial which is available ( ) function is used to test for

any records obtained. Returning a cost more than zero approach that statistics has been obtained. This facts received is examine through the Serial.read() characteristic and stored within the incoming Byte buffer. The output pin is set to low or high using the digitalWrite() function. Records is dispatched to an Android cell phone the usage of the Serial.println() function. For example, if facts received are "a", then the output pin 46 is low and "home equipment 1 is OFF!" is sent to the Android phone.

### 3.6 Android Application Development

Sony XperiaP with Android OS version 2.3.7 (Ginger Bread) became the cell phone used during this challenge. The Android utility was evolved in Java programming the use of Eclipse IDE with Android platform API8: Android 2.2 (Froyo), the lowest Android model that the utility can assist. More devices can be supported with decrease API stages however with fewer capabilities. It became crucial to make this decision before improvement because the software is not able to run on a platform beneath the Android 2.2 OS. BluetoothHome is the Android utility developed to control home appliances.

### 3.7 Eclipse Me

An integrated development environment which helps numerous programming languages [11] is called Eclipse IDE. It's far written particularly in Java, but it's miles an extensible plugin device which could expand packages in different programming languages such as C, C++, Perl, PHP and Python. Eclipse incorporates the Eclipse Java development equipment (JDT) for Java, Eclipse CDT for C/C++, Eclipse PDT for PHP and others. Eclipse with ADT plugin is the endorsed IDE for Android utility development.

The Java source file, layout file, strings.xml and AndroidManifest.xml - are the four items which are needed to develop an Android application. BluetoothHome is composed of activities (MainActivity.java and DeviceListActivity.java) and a provider (BluetoothControl carrier.java). These 3 Java supply documents manage data dispatched and information received and there are five format documents: activity\_device\_list.xml, activity\_main.xml, custom\_title.xml, device\_name.xml and message.xml. There are other documents: strings.xml and AndroidManifest.xml.

## 4. Work Plan

The home automation system based on Bluetooth using an Android phone was successfully implemented. This prototype consists of a controller, power sockets connecting the house appliances to the controller and an Android application (BluetoothHome) imparting the person interface for remotely controlling the home appliances. BluetoothHome is able to manage domestic appliances within the region of the house. The house appliance is become on/off straight away without any delay whilst the button is pressed.

### 4.1 Running Using Android Debug Bridge

The application will be allowed by Android Debug Bridge (adb) to run on the phone which is connected via a USB. In the phone settings USB debugging option must be selected. The adb driving force has to be set up onto a computer before it could be used. Some telephones have an adb driving force inside them and it could be mechanically hooked up whilst connected to a laptop. Phones without an adb driving force have to download it from the internet. BluetoothHome is run on Sony Xperia P through adb due to the fact the emulator does now not help Bluetooth based packages.

### 4.2 Debugging Using Android Debug Bridge:

BluetoothHome is debugged on Sony Xperia P through adb. A toggle breakpoint is put in the line declaration (byte [] buffer = new byte [256];) to perceive the received information in the buffer. A step-over operation is used in the course of debugging and the records obtained in the buffer is [72, 111, 109, 101, 32, 65, 112, 112, 108, 105, 97, 110, 99, 101, 32, 49, 32, 105, 115, 32, 79, 78, 33] that's ASCII code as shown in discern eleven; 72 is "H" and 111 is "o". This code is routinely translated into the readable sentence (domestic appliance 1 is ON!) and displays in the main UI.

### 4.3 Limitations And Troubles Encountered:

Some problems were encountered for the duration of this assignment. Bluetooth connection of the Android application could not be installed within the early levels of this project. This hassle become solved after referring to the online answer on Android Bluetooth APIs. Similarly, BluetoothHome was not able to display the records obtained efficiently. This problem becomes solved by means of setting a flag inside the statistics listening loop. but, any other trouble became that the listing view is unable to show the first individual ("H") of the first facts obtained. The list view is able to show the following records acquired efficiently.

## 5. Conclusion

It can be concluded that the goals of this venture were achieved, i.e., to broaden a low value and high reliability home automation gadget. In addition, a person-pleasant Android application as an opportunity to the faraway control unit of a home automation system has also been mounted. Upgrades can be made to improve this undertaking. A few guidelines are:

- The Bluetooth connection among the Android phone and the controller is routinely mounted while the consumer starts the BluetoothHome, supplied the smartphone's Bluetooth is turned on.
- An LCD display is incorporated into the controller to provide the fame of the house home equipment.
- BluetoothHome is capable to manipulate television channels, air con temperatures and so forth.



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