

Home Automation on Android Using Arduino

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Abstract

Home automation system is obtaining fashionable and wide utilized in lots of homes worldwide. it's loads of blessings to users even additional to the disabled and/or aged users within which it'll build it easier for them to regulate their home appliances. Home automation systems will be tagged to 2 medium within which however it's connected and that they square measure either wired or wirelessly connected. The most distinction between these 2 types is that home appliances square measure joined wirelessly a central controller if it a wireless home automation system. On the opposite hand, the appliances square measure connected to a central controller if the medium use wired communication methodology. Wireless system had been introduced in order to dispose of wired communication among home appliances Arduino based. This project presents a web-based, flexible automation system, which is basically android based home automation systems for wireless communication. The main concept of home automation through android mobile is that "physically challenged and disabled people" can also use his system to control their home appliances. However, end users, especially the disabled and old aged due to their complexity and cost, do not always accept these systems. And the mobile phone is the inseparable part of human lives today. With the help of mobile phones human can done many works related to their civil life. At today's repaired technology the mobile phone is also become smart one. With the help of this smart gadget we can make our home smart one. Home automation Systems (HASs) represents a great research opportunity in creating new fields in engineering, architecture and computing HASs becoming popular now a day and enters quickly in this emerging market. The system is designed in user-friendly interface as well as easy of installation. In this device we will also implement one GSM module for when there will be more traffic of internet users and if we cannot get the internet connection with the help of GSM module we can control the appliances by sending message to the main circuit board of home.

Keywords: Android, arduino board, blynk, arduino IDE

INTRODUCTION

Today we have a tendency to live in twenty first century wherever automation is taking part in vital role in human life. Today's world is digitized. Ranging from our hand-held device to computers to good appliances, our world is digitized. So a wise home would be successive step for an improved future. Home automation system has been developed for purpose of security, dominant and observance. The most construct is to make a wireless dominant system for homes and offices as a result of it offers user a snug

surroundings to use home appliances. This method is principally designed for the wireless shift practicality embrace energy saving, energy laws & appliance management. An humanoid good phone connected with Arduino microcontroller send management signal to Arduino. On receiving signal Arduino method it perform task to manage home appliances. good home systems have captured many technologies to date and product square measure out there within the market. In line with the information revealed by the analysis| and market intelligence firm ABI

research in 2013, regarding four million home automation systems were oversubscribed globally. They additionally calculable that ninety million home worldwide can use home automation systems by the tip 2017. Recently, ZigBee primarily based technology developed for top level communication protocols square measure went to produce personal space network. In our day to bioscience plays a crucial role. The various devices create our life comfy however we have a tendency to still feel there ought to be atomization provided in our home or business. Thanks to quick development of technology, future communication and transmission area unit wholly depends upon wireless network. Wireless communication within the term of wireless network style and management that upgrading the forthcoming wireless communication technology over wide selection. The most set up is to automatically management and monitor electrical and electronic home appliances. Wireless technologies like GSM, Wi-Fi, and net are of nice use in varied sectors together with industries that area unit addressing the energy automation product. The wireless technologies provide nice flexibility within the operation and management of devices across a definite vary reckoning on the technology that's being employed. Home automation not solely refers to cut back human efforts however additionally energy saving and time potency.

LITERATURE REVIEW

- Rajeev Piyareet.al proposed a low cost and flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and Appliances remotely using Android based Smart phone app. [1]
- DeepaliJavaleet.al presented the planning of home automation and security system exploitation golem ADK that is predicated on a standalone embedded system board golem ADK (Accessory Development Kit) reception. [2]
- Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C &Ratnaparkhi N.S. This proposes a Home Automation system that employs the combination of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to supply the user with device of assorted lights and appliances at intervals their home. This method uses a consolidation of a transportable application, hand-held wireless remote, and computer based mostly program to supply a method of programme to the purchasers. [3]
- DeepaliJavale, Mohd. Mohsin, Shreerang Nandanwar the prime objective of this can be to help handicapped/old aged individuals. It provides basic plan of the way to management numerous home appliances and supply a security exploitation golem phone/tab. The planning consists of golem phone with home automation application, Arduino Mega ADK. User will move with the golem phone and send signal to Arduino SDK that successively can management different embedded devices/sensors. [4]
- Basil Hamed the main objective of this Paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by LabVIEW. [5]
- Prof. R.S. Suryavanshiet.al discussed a approach in which a model of Home Automation System Using Android and Wi-Fi technology, which really offers easy and really much awaited Home Automation Systems (HAS). [6]
- Home Akanksha Singh et.al presented the paper on how to control home appliances, safety & security system using GSM technology by using android application through android mobile phone. It can control the appliances even in the absence of android phone by sending a normal sms. [7]

- Prof.R.A.Kaduet.al discussed the paper that permits multiple users to manage associated monitor home appliances just by an android application put in on movable. It is no matter their locations with comparatively low value style, easy interface. [8]
- Satish Palaniappanet.al explained this paper survey of all existing system like Wi-Fi, GSM, Bluetooth, ZigBee and compare the out there feature. Supported all the system surveyed, is known as ideal system for home automation with remote access. [9]
- Gowthami.Tet.al explained the paper that introduces a sensible home system that might supervise family appliances remotely and understand period observance of home security standing through movable. This project describes the ZigBee module and humanoid based mostly home observance system for security, safety and attention for human. [10]
- In the authors centered on a model which may be to manage domestic appliances victimization GSM technology and informatics controlled home automation. The analysis undoubtedly provides future scope in coming up with and implementation of HAS victimization informatics management. [11]

SYSTRM ARCHITECTURE

The Android Home Automation project comes with a free application called. This android application controls the various appliances connected to your Arduino and relays. When the toggle buttons on the application are pressed, corresponding 2G,3G,4G signals are sent from your

android phone to the module you have hooked up to your Arduino. The Arduino finds out which signal was sent and compares it to the predefined signals assigned for each appliance. When it identifies that signal, then the Arduino activates the relay hooked up to its digital pin by passing 5V through it. Thus the relay is switched ON and the corresponding appliance connected to the relay is turned ON as well. To switch it OFF, Arduino passes a 0V or logic low to its digital pin. This home automation system is first implemented using SMS. This requires a mobile at both transmitting and receiving side. This system is SMS based and uses wireless technology to revolutionize the standards of living. The below architecture showing a sms coming from mobile received by corresponding device via internet and given to on-board devices such those appliances are controlled using wireless technology. Smart Home systems face four main challenges; these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface.

FLOWCHART FOR MONITORING THE HOME APPLIANCES

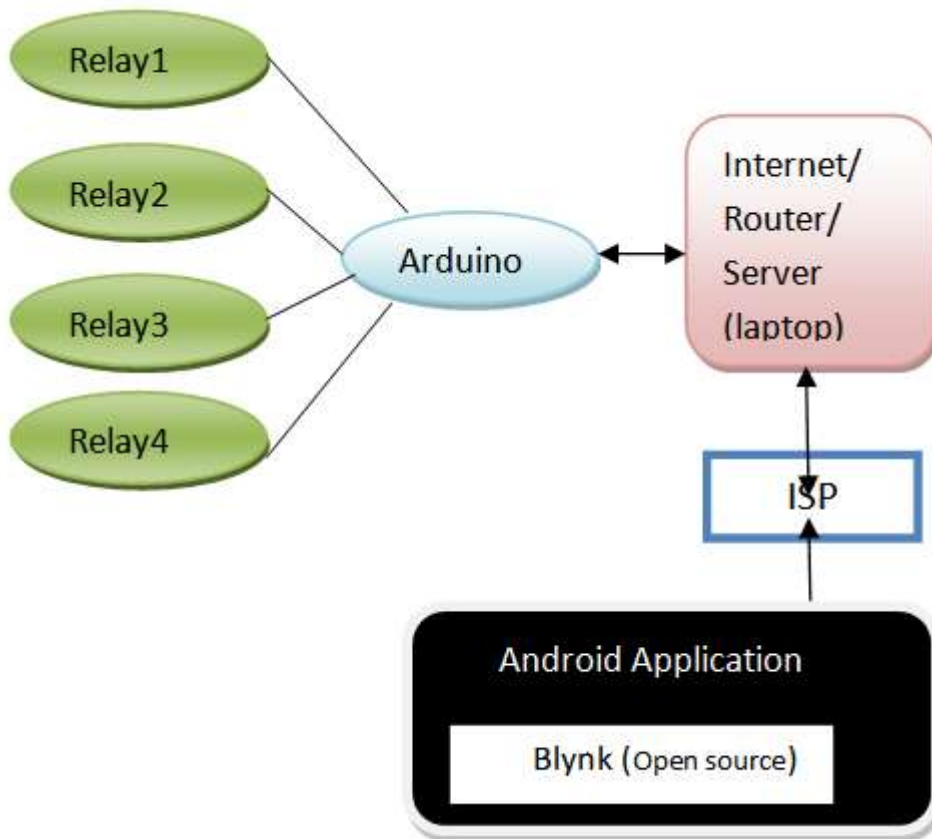
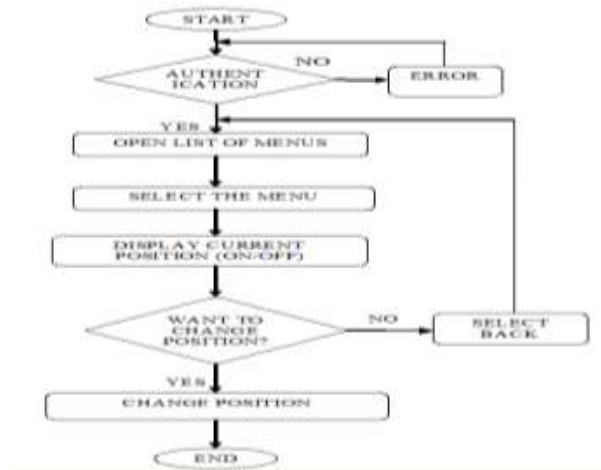


Fig. 1: System Architecture.

**HARDWARE IMPLEMENTATION
ARDUINO UNO BOARD**

Arduino is an open-source component and software package company, project and user community that styles and manufactures microcontroller based mostly kits for building digital devices and interactive objects which will sense and

management the physical world. The Arduino Uno incorporates a range of facilities for act with a pc, another Arduino, or alternative microcontrollers. The ATmega328 provides UART TTL (5V) serial communicate-on, that is accessible on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board

channels this serial communication over USB and seems as a virtual comport to software package on the pc.

The Arduino software package includes a serial monitor that permits straightforward matter knowledge to be sent to and from the Arduino board. The RX and TX LEDs on the board can flash once knowledge is being transmitted via the USB-to serial chip and USB affiliation to the pc (but not for serial communication on pins 0 and 1).

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

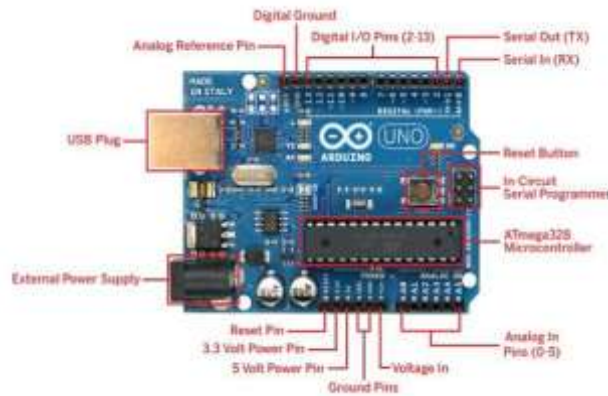


Fig. 2: Arduino UNO Board.

"Uno" suggests that one in Italian and was chosen to mark the discharge of Arduino software system (IDE) one.0. The Uno board and version one.0 of Arduino software (IDE) were the reference versions of Arduino, currently evolved to newer releases. The Uno board is that the 1st in a very series of USB Arduino boards, and therefore the reference model for the Arduino platform; for an in depth list of current, past or noncurrent boards see the Arduino index of boards. Arduino may be a tool for creating computers that may sense and management additional of the physical world than your PC. The Uno may be a microcontroller board supported the ATmega328P. it's fourteen digital input/output pins (of that 6 can be used as PWM outputs), six analog inputs, a sixteen megacycle quartz, a USB association, an influence jack, associate ICSP header and a push. It contains everything required to support the microcontroller; merely

connect it to a laptop with a USB cable or power it with an AC-to-DC adapter or battery to urge started. You'll be able to tinker together with your UNO without fear an excessive amount of concerning doing one thing wrong, worst case situation you'll be able to replace the chip for some greenbacks and begin yet again.

CHANNEL RELAY

A relay is sometimes a mechanical device that's motivated by AN electrical current. This flowing in one circuit causes the gap or closing of another circuit. Relays are like device switches and are employed in several applications due to their relative simplicity, long life, and verified high dependableness. Relays are employed in a good kind of applications throughout trade, like in phone exchanges, digital computers and automation systems. Extremely subtle relays are utilised to shield electrical power systems against

bother and power blackouts additionally on regulate and management the generation and distribution of power. Within the home, relays are employed in refrigerators, laundry machines and dishwashers, and heating and air-

conditioning controls. Though relays are typically related to electrical electronic equipment, there are several alternative sorts, like gas and hydraulic. Input is also electrical and output directly mechanical, or contrariwise.



Fig. 3: Channel Relay.

A relay is associate electrically operated switch. Several relays use associate magnet to work a switch mechanism, however different operational principles are used. Relays notice applications wherever it's necessary to regulate a circuit by a low-power signal, or wherever many circuits should be controlled by one signal. the primary relays were employed in long distance telegraph circuits, repetition the signal coming back in from one circuit and re-transmitting it to a different. Relays found in depth use in phone exchanges and early computers to perform logical operations. A sort of relay which will

handle the high power needed to directly drive an electrical motor is termed a connexion. Solid-state relays management power circuits with no moving components, instead employing a conductor triggered by lightweight to perform switch. Relays with label operational characteristics and generally multiple operational coils are wont to defend electrical circuits from overload or faults; in trendy wattage systems these functions are performed by digital instruments still referred to as “protection relays”.



Fig. 4: Hardware Implementation.

SOFTWARE IMPLEMENTATION

Android Studio

Android Studio is the official IDE for Android application development software. Android Studio offers: Flexible Gradle-based build system, Build variants and multiple .Apk file generation, Code templates to help you build common app features, Rich layout editor with support for drag and drop theme editing, ProGuard and app-signing capabilities, Built-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine. And much more.

Android

The android package is open-source, that means its source code is offered to finish users for gratis. The tip users will wrongfully modify the source code. This open-source nature makes the humanoid package simply customizable. However, most humanoid devices feature a mix of each open-source and proprietary software system. Though humanoid originally created the package for mobile devices, Google has developed variants like humanoid TV for televisions, humanoid Wear for wristwatches and humanoid motor vehicle for cars. Every variant options a specialised computer program. Google has additionally developed versions for digital cameras and game consoles [12]. For this home automation and security system we have a tendency to square measure targeting humanoid platform since it's immense market and open supply. android may be a software system stack for mobile devices that has package, middleware and key applications. The humanoid OS relies on UNIX. Android Applications square measure created in a very Java-like language

running on a virtual machine referred to as 'Dalvik' created by Google. The android SDK provides the tools and arthropod genus necessary to start developing applications on the android platform victimisation the Java programming language. Accent mode may be a feature of android OS since version a pair of.3.4 cake and 3.1 Honeycomb.

BLYNK SERVER

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, and it can store data, visualize it and do many other cool things [13].

There are three major components in the platform:

- **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.
- **Blynk Server** - responsible for all the communications between the smartphone and hardware. You'll be able to use our Blynk Cloud or run your non-public Blynk server regionally. Its ASCII text file might simply handle thousands of devices and might even be launched on a Raspberry Pi.
- **Blynk Libraries** - for all the popular hardware platforms - modify communication with the server and method all the incoming and out coming back commands [13].
- Now imagine: when you press a Button within the Blynk app, the message travels to the Blynk Cloud, wherever it as if by magic finds its thanks to your hardware. It works an equivalent within the other way and everything happens during a blynk of a watch.

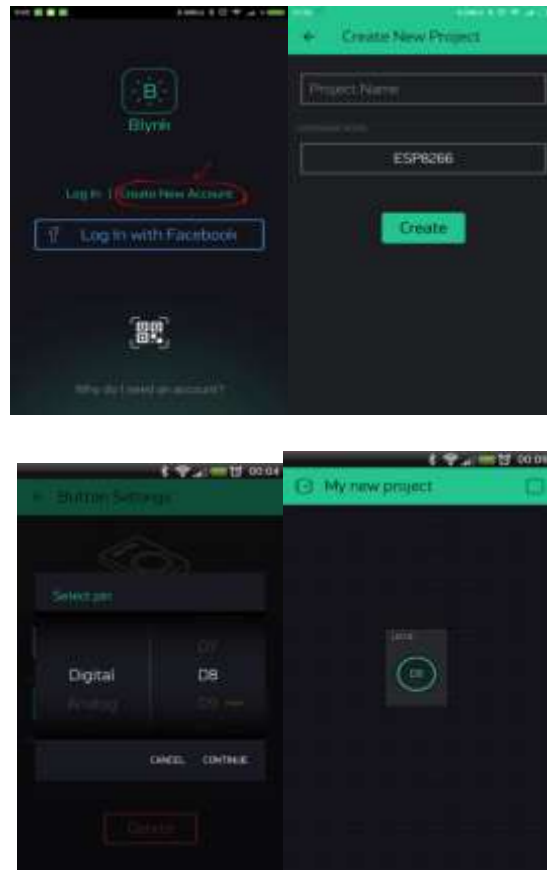


Fig. 5: Software Implementation.

APPLICATIONS

1. We can control device from a long distance, thus it gives ease of access.
2. Home Appliances controlling using Mobile is having faster operation and is very efficient.
3. No need to carry separate remote or any other controlling unit.
4. The system can call the home owner on their mobile phone to alert them, or call the fire department or alarm monitoring company.
5. Security systems can include motion sensors that will detect any kind of unauthorized movement and notify the user through the security system or via cell phone.
6. An intercom system allows communication via a microphone and loud speaker between multiple rooms.
7. We can control device from a long distance, thus it gives ease of access.

8. This device can measure the cost of electricity per unit.
9. Home automation- this project can be used to control various home and industrial appliances.
10. Security cameras can be controlled, allowing the user to observe activity around a house or business right from a Monitor or touch panel.

ADVANTAGES

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. [14]

1. **Inexpensive**- Arduino boards are comparatively cheap compared to different microcontroller platforms. The smallest amount overpriced version of the Arduino module will be

assembled by hand, and even the pre-assembled Arduino modules price but \$50.

2. **Cross-platform** - The Arduino software (IDE) runs on Windows, Macintosh OSX, and operative system} operating systems. Most microcontroller systems are restricted to Windows.
3. **Simple, clear programming environment** - The Arduino software (IDE) is easy-to-use for beginners, however versatile enough for advanced users to require advantage of still. For lecturers, it's handily supported the process programming atmosphere, therefore students learning to program in this atmosphere are at home with however the Arduino IDE works.
4. **Open source and extensible software** - The Arduino software is revealed as open supply tools, obtainable for extension by intimate with programmers. The language will be expanded through C++ libraries, and other people eager to perceive the technical details will create the leap from Arduino to the AVR C programing language on that it's based mostly. Similarly, you'll add AVR-C code directly into your Arduino programs if you would like to.
5. **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

CONCLUSION

It can be concluded that home automation system using arduino was success. This system consists of an Arduino-Uno board, an Android phone, power sockets, home

appliances and an android Application it is user friendly and it is cost effective. In this system, a novel architecture for low cost and flexible home control and monitoring sys-tem using Android based Smart phone is pro-posed and implemented. The proposed architecture utilizes a micro web server and Bluetooth communication as an interoperable application layer for communicating between the remote user and the home devices. Any Android based receives status updates from them and also send control information to the microcontroller Arduino.

Smart phone with built in support for Wi-Fi can be used to access and control the devices at home. When a Wi-Fi connection is not available, mobile cellular networks such as 3G or 4G can be used to access the system. The system also uses the Google speech recognition engine thus eliminating the need for an external voice recognition module. Prospective future works include incorporating SMS and call alerts, and reducing the trolling and monitoring the smart home environment.

REFERENCES

1. Rajeev Piyare1 and Seong Ro Lee "Smart Home-Control and Monitoring System Using Smart Phone".
2. DeepaliJavale, MohdMohsin, ShreerangNandanvar, MayurShingate, "Home automation & security using Android ADK", International Journal of Electronics Communication and Computer Technology (IJECCCT) Volume 3 Issue 2 ,March 2013.
3. Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C &Ratnaparkhi N.S Department of Computer Engineering, 44, Vidyanagari, Parvati, Pune-411009, India University of Pune, "Home Automation using Cloud Network and Mobile Devices"

4. CharithPerera, Student Member, IEEE, ArkadyZaslavsky, Member, IEEE, Peter Christen, and DimitriosGeorgakopoulos, Member, IEEE “Context Aware Computing for The Internet of Things: A Survey”. IEEE COMMUNICATIONS SURVEYS & TUTORIAL
5. DeepaliJavale, Mohd. Mohsin, Shreerang Nandanwar “Home Automation and Security System Using Android ADK” in International Journal of Electronics Communication and Computer Technology (IJECCCT) Volume 3 Issue 2 (March 2013)
6. Prof. R.S. Suryavanshi, KunalKhivensara, and Gulam Hussain, Nitish Bansal, Vikash Kumar” Home Automation System Using Android and Wi-Fi”, International Journal of Engineering and Computer Science ISSN: 2319-7242 Volume 3 Issue 10 October, 2014.
7. Akanksha Singh, Arijit Pal, Bijay Rai “GSM Based Home Automation, Safety and Security System Using Android Mobile Phone”, International Journal of Engineering Research & Technology (IJERT) Vol. 4 Issue 05, May-2015.
8. Prof.R.A.Kadu, P.P.Dekhane, S.J.Dhamanwala, A.S.Awate “Real Time Monitoring and Controlling System”, Thee International Journal of Engineering and Science (IJES).
9. Satish Palaniappan ,Naveen Hari Haran ,Naren T Kesh ,Vidhyalakshimi S ,Angel Deborah S “Home Automation Systems - A Study”, International Journal of Computer Applications (0975 – 8887) Volume 116 – No. 11, April 2015
10. <http://source.android.com/tech/accessories/index.html>
11. <http://arduino.cc/en/Main/ArduinoBoardADK>
12. https://www.tutorialspoint.com/android/android_tutorial.pdf
13. <http://www.csd.uoc.gr/~hy439/labs/hy539AndroidIntro2012.pdf>