ANDROID BASED SMART HOME AUTOMATION

Dr. Suneetha Uppala

Faculty, Department of Electroics,
S.K.university, Anantapur,INDIA

Abstract: **This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. This system is designed to assist and provide support in order to fulfil the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home. The switch mode is used to control the home appliances. The visual feedback is received in the android application. The main control system implements wireless technology to provide remote access from smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method.**

Keywords: **Android, home automation, smart home, Wi-Fi and QT**

1.   Introduction:

The terms "Smart Home", "Intelligent Home" followed and has been used to introduce the concept of networking appliances and devices in the house. Home automation Systems (HASs) epitomises a great research opportunity in creating new fields in electronics and Computing. HASs contains centralized control of lighting, appliances, security locks of gates and doors and other systems, to provide improved comfort, energy efficiency and security system. HASs becoming popular nowadays and enter quickly in this emerging market [1]. However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems.

Due to the advancement of wireless technology, there are several different of connections are introduced such as GSM, WIFI, and Bluetooth. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design [2]. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

The design of home automation and security system using Arduino adk, a credit sized computer. Arduino adkprovides the features of a mini computer, additional with its digital pins where other components and devices can be connected. Digital pins of Arduino adkare used for the output purposes. We have design a power strip that can be easily connected to GPIO Pins of the Arduino adk.The home appliances are connected to the input/output ports of Arduino adkalong with the power strip and their status is passed to the Arduino adk. The android running OS in any phone connected to a network can access the status of the home appliances via an application. It presents the design and implementation of automation system that can monitor and control home appliances via android phone or tablet [3].

2.   Design steps:

1.   Wi-Fi
2.   Arduino ADK
3.   Relays with ac and dc power sources.
4.   Transistor as a Switch.
5.   Software.

The project aims at designing a prototype for controlling the home appliances that can be controlled wirelessly via an application that provides the features of recognition and switch modes according to an application is run on android device. The system can be used in wide range of areas.

2.1 Wi-Fi:

Wi-Fi connection to send video, audio, and telemetry operation, while accepting remote control commands from an operator who can be located virtually anywhere in the world. The **Arduino Wi-Fi Shield** connects your Arduino to the internet wirelessly. Connect it to your wireless network by following a few simple instructions to start controlling your world through the internet. As always with Arduino, every element of the platform hardware, software and documentation is freely available and open-source. This means you can learn exactly how it's made and use its design as the starting point for your own circuits Many Wi-Fi shields available in market which are more suitable for Arduino adk.

2.2 Arduino MEGA ADK:

A The Arduino MEGA ADK is a microcontroller board based on the ATmega2560. It has a USB host interface to connect with Android based phones, based on the MAX3421e IC. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The MEGA ADK is based on the Mega 2560. SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin that is reserved for future purposes. Stronger RESET circuit.

2.3 Relays with ac and dc power sources:

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state. The power strip is designed and relays are connected to power strip. The home appliances are connected to the power strip. The Relays are connected to the digital IO pins of Arduino ADK controller. The detail circuit is shown in figure1.
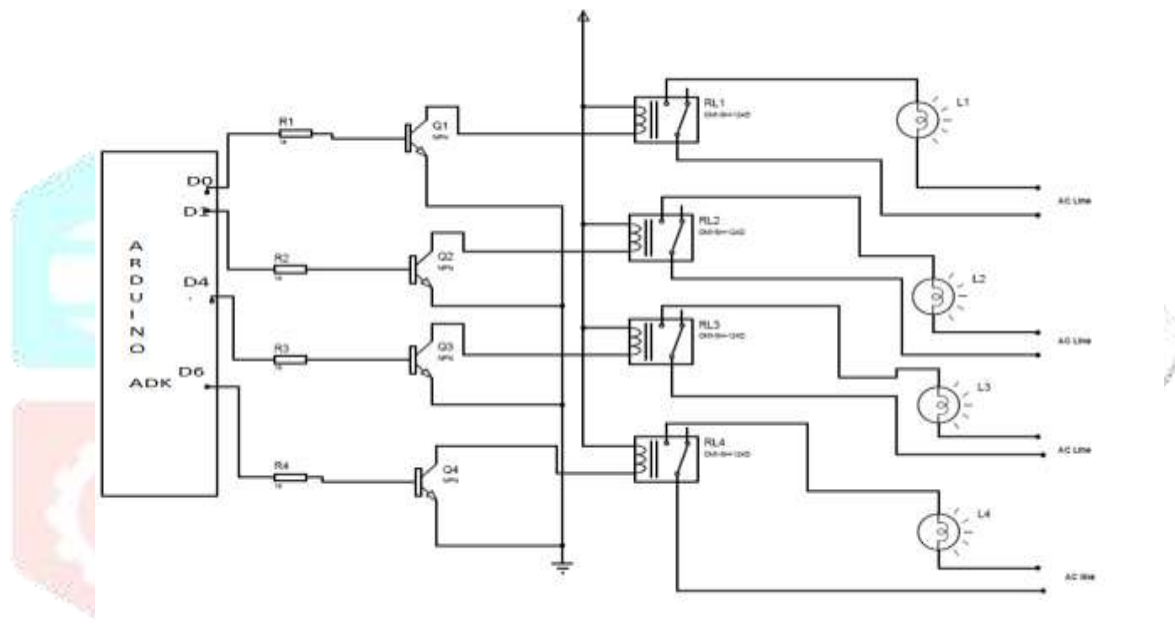

Figure 1: circuit for relays connected using transistor as a switch

2.4 Transistor as a switch:

The circuit of a relay driver using the NPN transistor BC 548. The relay is connected between the positive rail and the collector of the transistor. When the input signal passes through the I K resistor to the base of the transistor, it conducts and pulls the relay. The relay driver transistor, a short lag can be induced so that the transistor switches on only if the input signal is persisting. Again, even if the input signal ceases, the transistor remains conducting till the capacitor discharges completely [4].

2.5 Software:

There are different software's require for this project the details are shown in below.

QT:

QT is a set of several computer software products and specifications from Oracle Corporation that provides a system for developing application software and deploying it in a cross-platform computing environment. QT is used in a wide variety of computing platforms from embedded devices and mobile phones on the low end, to enterprise servers and supercomputers on the high end.

Python:

Python is an interpreter, interactive, object-oriented programming language. It incorporates modules, exceptions, dynamic typing, very high level dynamic data types, and classes. Python combines remarkable power with very clear syntax. It has interfaces too many system calls and libraries, as well as to various window systems, and is extensible in C or C++. It is also usable as an

extension language for applications that need a programmable interface. Python is a high-level general-purpose programming language that can be applied to many different classes of problems.

Conclusion:

The prime objective of our project is to use the Smartphone to control the home appliances effectively. The switch mode and voice mode are used to control the home appliances. The visuval feedback is received in the android app. This project is based on the Arduino adk, Android platform QT and Python. These platforms are Free Open Source Software. So the overall implementation cost is low and can be easily configured. User can easily interact with the android phone/tablet. The user can send commands via the switch mode or speech mode. The data are being analyzed by the application and are sent over a network. The Arduino adkacts as a server, analyses the data and activates the digital input and output Pins. The GPIO Pins are connected to the relays switch which activated the required home appliances. In this way, automation process is carried out. This is a simple prototype. Using this as a reference further it can be expanded to many other programs

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