

Home Automation System

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Submitted: 15-09-2021

Revised: 25-09-2021

Accepted: 28-09-2021

ABSTRACT: The demand for the automation technology has gained a lot of popularity in recent years and also for the forthcoming generation. The key features or challenges for this system are privacy and smart work. We have made this project keeping minimum budget and easy installation in mind and that is wireless based home automation system. When anybody use this technology, then this technology upgrades the day-to-day life by decrease our client's effort, this project is energy efficient and easy installation thus making it a modern home. It's very much beneficial for physically disabled people. Home appliances like bulb, fan and door lock etc can be controlled using our home automation system. By using the smart phone application we can control the appliances which also increase the security by using the 'ON' and 'OFF' commands. This system is completely safe from shock and saves a lot of time, energy and cost, adds quality to life and comfort for users.

Keywords: Arduino UNO, Bluetooth HC-05, 4channel 5V relay, security, Home automation System.

INTRODUCTION:

In recent years the use of remote has been increased for most of the things which are in vast use. The main concept is to create an automated network connecting the appliances to the house. Almost every adult in this world uses a smart phone through which they can perform most of the activities. There are lots of companies advertising of a smart house but none of it has entered the mainstream but none of it has successfully launched the system. The automation system uses an Arduino Uno board, 4 channel 5V relay, Bluetooth module HC-05 with the connecting wires, bread board, an android application and appliances to be connected home automation contains a level of programmed and mechanized structure to control the appliances which is easy to

use and saves time, energy and money at the same time but it be in the range of the Bluetooth. Today, we have remote control (R.C) for our TV sets and others electrical appliances, which have made our day-to-day life very much easy. Have you ever listen about home automation which can give us the wireless control to operate our LED, fan and other electronics appliance at our place by using a wireless based R.C? It is absolutely yes but, are the options which are available is lower in price? If ans is no, then we can help your by giving you the very much cheaper wireless based home automation system by which you can control your home appliances without wasting money on any other remote control devices which is very much costly as compared to wireless based home automation system. This is the new system which has the ability to control any electrical product by using your Smartphone. And we all know that our minutes is important thing and everyone wants to reduce their minutes as much as they can. This project will help us by reduce our effort and time at the same time and that is wireless based home automation.

PROJECT DESCRIPTION: Wireless based home automation is one of the best arduino Uno Project. Bluetooth module (HC-05) wireless based home Automation using Arduino Uno project helps the person to control any appliances which is run using electricity and the main operator is android application on our Smartphone. The smart phone sends the information to the Arduino Uno board through wireless communication which is our Bluetooth. The Arduino Uno is connected to the most Printed Circuit Board which has 4Relays as shown in the figure which is mention below, Device 1- LED, Device 2- Fan. When any of the users which is using this application presses on the 'ON' button which is displayed on the

application in our smart phone for the device 1, Then LED is switched 'ON'. The LED are often transitioned, by pressing an equivalent Button again. Same thing is done when any of the users trigger the 'ON' button which is displayed on that application for the device 2, Then the Fan is turned 'ON'. This wireless based home automation using Bluetooth and Arduino Uno are often used for controlling any alternative current or direct current devices. In the demo project, we've used DC fan and DC bulb. To run this Direct Current lights and fan, 12v adapter is connected through the circuit.

PROJECT AIM: This project aim is to build & construct a wireless based home automation system using arduino Uno that will remote control to set or reset any house appliances connected to through it, by using a microcontroller Atmega318 or Bluetooth based android application. The main target of this project is to implement a budget friendly, easy to install and scalable wireless based home automation system which is to be used by android application to switch 'ON' or "OFF" any House appliance, using a microcontroller to get hardware easy budget friendly short dial service from phone to trigger the switch state. This project work is complete through by remotely and automatically switching set or reset an electrical appliance.

CONCEPT: The main connection is connected to the power outlet of the electrical device. There are two things the first one is Sender and the second one is receiver in each of the control, that's why it can easily convert information with the master (a computer). Clients can enjoy the high technology and simplicity modern life style. All the setting will be able to reset default value, so people can move the device between different electrical devices and network. Automation boxes will be put into separate rooms at home, it is depending on the needed functionality. There are various different sensors could be attached to the boxes. Sensors are used as set/reset for actions that user can set up in the computer program.

HARDWARE REQUIREMENTS:

1. 4-Channel 5V relay
2. Bluetooth module HC-05
3. Arduino UNO

4. Power adapter 12V
5. Connecting wires
6. Breadboard

Software Requirement:

1. Arduino IDE
2. Android Application

Description Of Software Requirements:

- Arduino IDE software is used as a programming platform. We write programming code in Arduino IDE and after that we compile the programming code which we have written in our IDE Software and it's give proper result because our code is one hundred percent correct after then we use USB cable to transmit the programming code into our Arduino Uno board that's all the work we done in IDE.
- Android application is used to control our relays and the application which is used in this project is Automation

Description Of Hardware Requirements:

- **5V 4 CHANNEL RELAY** – It's a 5V 4-channel relay module interface board which is an electrically operated switch; to operate a switch mechanically every and single channel requires a driver electricity of 15mA-20mA. Various electrical appliances and equipments with large currents are controlled where it is required by the use of relay module and a circuit by a individually low power signal, or where by using one signal many other circuits can be controlled which are also equipped with high-current relays. It contains a standard interface and also isolated components that can be controlled directly by microcontroller (Single-chip ATmega128). 250VAC and 30VDC and 10A are the specified contacts on every relay in each case, which is clearly marked on the relay module. To protect the electrical circuits from overloading or faults a characteristic of relay modules called calibrated operating is used and sometimes different operating coils are also used; now a days these functions are called "protective relays" which are performed by digital instruments.



APPLICATION: For controlling a high voltage circuit which has a low efficiency of power circuit whenever it is required, especially when galvanic isolation is desirable then the relay is used. The very first use of relays as application was in telegraph lines (long), where the signals which are weak are received at an intermediate station that could control a contact, recreating the signal for further transmission. To control the devices with high voltage/current pilot switches and very little or low voltage wiring are used. Isolation from high voltage circuit is possible for the operators. For the electrical loads greater than the direct drive capability, the devices with low power like microprocessors can drive the relay module to control it. High current can be controlled with small wiring and contacts in the ignition key of the cranking motor when a starter relay in an automobile allows it. Claude Shannon studied the application of relay module for logical control of intricate switching system for example telephone exchange. Preliminary

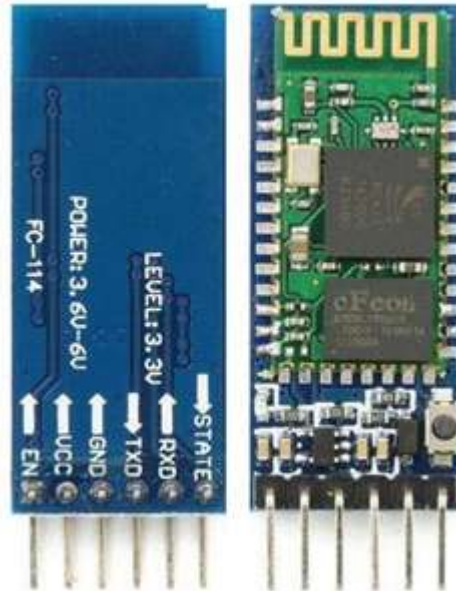
Electro-mechanical computers for example the ARRA, Harvard Mark II, Zuse Z2, and Zuse Z3 used relays for working and logic registers. However, the electronic devices proved to be easier and faster to use. Because relays are much more resistant than that of semiconductors to nuclear radiation, they are extensively used in safety-critical logic, like the control panels

of radioactive waste-handling machinery. Electromechanical protective relays are used to detect the overloading and other faults on electrical lines by opening and closing the circuit breakers. **BLUETOOTH HC-05 MODULE:** In the world of technology, the module which is useful as switching node between master and state mode is

called HC - 05 Bluetooth Module. It doesn't use receiving data and transmitting data. Some of the technical specifications of HC - 05 Bluetooth Module which makes it a very cool module is that the association of laptop PC or smart phones is very simple with the help of it. It also works with series of communication and TTL compatibility. This module can communicate with any device with Bluetooth functionally like a smart phone or PC(laptop). The interesting and important thing for the user is that the HC-05 module can be operated within 4-6V of power supply. This module is capable of transferring a maximum of bits in the baud rate of 9600, 19200, 38400, 57600, etc. Two ways of operations in which HC-05 can be used are (A) Command Mode and (B) Data Mode. Command mode means that communication of people with Bluetooth module is through AT components and while with the data mode transferring of the data for communication with other Bluetooth devices is done. For users it is very easy to pair two HC - 05 Bluetooth Modules as it enters the command mode with baud rate 38400, it is also easy to pair from Android phone. Somewhere trickiness comes when it has to pair with another HC - 05 module. Command modes can be used to configure the default values of the Bluetooth module. Nowadays anyone who is searching or looking for a wireless device or module that can possibly transfer the data from one computer to mobile phone and from Smartphone's to microcontroller or vice - versa then this device will be the best for the purpose. Bluetooth HC-05 is a module which has the purpose for wireless communication with Bluetooth Enabled devices (like Smartphone, tablet, laptop). It communicates with the

microcontrollers by the use of Serial communication (USART). In Bluetooth HC-05 module for alteration of the default setting we can use the AT commands. The 3.3 v level of the Bluetooth module can be detected as it already has

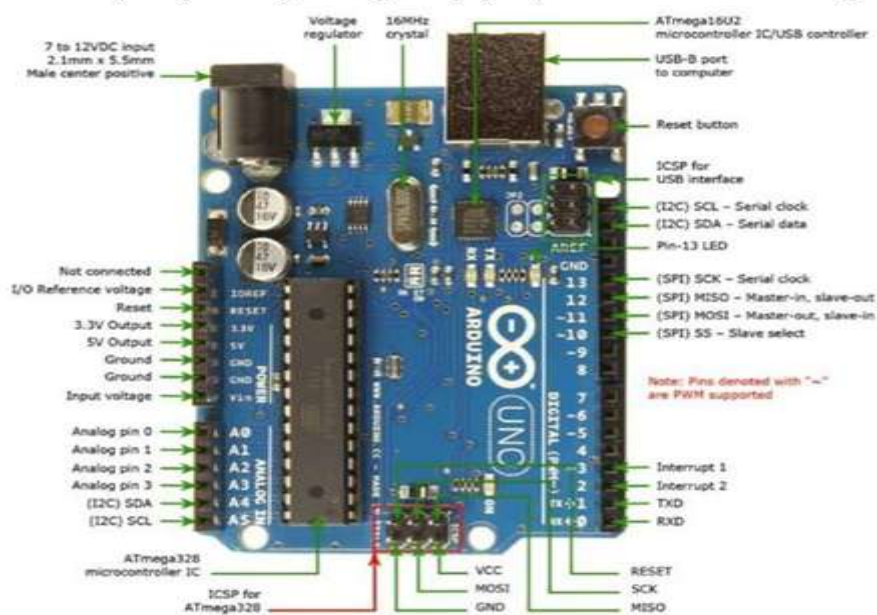
3.3 level for the Rx/Tx and microcontroller, therefore there is no requirement for the shifting of Tx voltage. But the transmit voltage level from the microcontroller has to be shifted to the Rx of the Bluetooth module.



Arduino Uno: Arduino Uno is an free-source platform (electronics) which is based on easy and free to use hardware & software. Microcontroller ATmega328P

is a single chip which can read the input and give outputs for example sensor light, turning on the LED, finger on a button or any notification message, output for an activating rotating motor. We can give information to our board what action to perform by transmitting some instructions to the Microcontroller ATmega328P. To perform such we have to use the Microcontroller ATmega328P programming language and IDE which is the Arduino Software, based on wiring connection and processing respectively. Microcontroller ATmega328P (Arduino Uno) was designed for ease and to make our work even faster and was designed at the Ivrea Interaction Design Institute. It

was aimed for the students with no background in programming & electronics. The Microcontroller ATmega328P (Arduino Uno) board started changing as it reached wider community to adapt to new challenges and needs. Products for IoT applications, wearable, 3D printing, and embedded environments are distinguished from simple 8-bit boards. Every Arduino are fully open-source and authorize to clients to build them independently and eventually adapt them according to their needs. It is a microcontroller board on the AT mega 328p consisting of 14 input/output pins (of which 6 can use as PWM outputs), 6 analogs Inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICPS Header, and a reset button. It gives power to the microcontroller and can be started in two ways: a) by connecting it to a computer with a USB device. b) by giving it power with ac and dc.

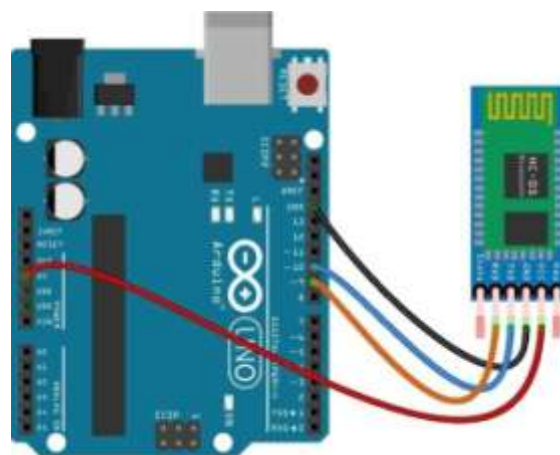


It is not useful in FTDI USB to serial driven chip as arduino board differs from every partition boards. Some specification of Arduino Uno is mention below:

1. Microcontroller board ATmega328P
2. Operating at voltage 5V
3. Recommended Input voltage 7-12V
4. Limits of Input voltage
5. Digital Input/Output Pin-14
6. Analog input pins-6
7. Direct current (d.c) current per I/O pin 40mA
8. Direct current (d.c) current for 3.3V pin 50mA
9. Flash memory 32KB by which 0.5 KB used by Boot loader
10. SRAM of 2KB
11. EEPROM of 1KB
12. Clock Speed 16 MHz

POWER ADAPTER 12V: We use power adapter of 12V for supplying the power to the circuit (Arduino Uno Board) and when we gives the power to the circuit (Arduino Uno) it distribute the power to the component where power supply is required as per need.

DESIGN AND IMPLEMENTATION: The design of our system is very efficient smart home system and has a very low cost. The software communication module is one of the system module while the hardware interface is the other module , these are the two main modules. The arduino microcontroller is the heart of this system. The functioning as a micro web server and the microcontroller is passed through the system this is what the system is capable of.



ADVANTAGES OF THIS PROJECT:

1. Easy to use: Since everything in the system will be automated it is user friendly and also very easy installation.
2. Saving: Using the home automation literally decreases the electric city bills by turning off the appliances you don't need by a tap of your finger. So no more waste of money.
3. Security: Automated locks and switches provide security to the system as you no need to worry about what's behind the curtains or shadows when not at home which can save the house from robbery.
4. Energy: Saves lots of human as well as electric energy with a tap of your finger.

FUTURE WORK: As mentioned earlier, the demand has increased all over the world due to its low cost and time saving hence making the home even smarter. The system can be made more secure and handy by adding different features like biometrics, increase in range, including light and temperature sensors and addition of more other appliances to be automated.

CONCLUSION: Cheaper in price, flexible and without wire based home automation system was successfully built with all the appliances working satisfactorily when connected and used it through the automation application. Few errors occurred but they are resolved on time and hence successfully built the project. The mainly focused on wireless based home automation using arduino Uno board, this wireless based home automation project is completely environment friendly.

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