

# MODULAR ACTUATING SYSTEM

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## ABSTRACT

*The usage of an Arduino UNO microcontroller with local Bluetooth connectivity is described in this paper as a low-cost, flexible, and reliable switch automation system with increased security. This allows users to remotely access and operate devices. The proposed method starts with industrial machinery and ends with consumer goods, using the Internet of Things and mechatronics as the toggle mechanism to regulate desirable appliances for people. Switch automation systems employ a variety of techniques to achieve a range of objectives, from enhancing daily comfort to encouraging more independence for the aged and disabled. The system's design, which is based on the Arduino IDE and uses embedded C, includes Bluetooth, which is utilized for controlling activities. The switch's status, including whether it is on or off, is displayed by the Android app. The application ensures that electricity is used efficiently by warning the user about connections that are left on needlessly. Cost-cutting, energy-saving, and monitoring are aided by this. The project employs a variety of switch automation forms and combines software and hardware technologies in its implementation.*

**Keyword :** - Home Automation, Switch Automation, Actuators, Modular System, Switch Trigger

## 1. INTRODUCTION

Recent years have seen a huge change in technology. These developing technologies intend to help people and simplify their lives. Wireless technologies are increasingly being used in automation. A wide range of connecting devices are offered on the market to address the problem of the communication medium between the device and the microcontroller as a result of the swift development of wireless technology. Technologies including ZigBee, Z-wave, NFC, Bluetooth, Wi-Fi, and others serve as dependable communication routes. Both RF and ZigBee are used in the majority of wireless networks.

The disadvantages include its susceptibility to ear wax and moisture damage, as well as its small size, which can make dexterity difficult. Switch automation is the technique of automating a switch to operate an electrical device. Because with COVID, our way of life has altered. Our homes and workplaces will need to be adjusted to provide viral protection in order to adapt to these new changes. Many electrical and electronic items may be found in every house and business, and more people are remodeling their homes and workplaces to integrate automation systems. Our homes, companies, and appliances may all be controlled and monitored remotely. There are other ways to automate, including with Bluetooth. However, the user can manually alter the appliance's mode of operation to suit their requirements.

The switch employed in this design can also be manipulated manually, even if the "Modular Actuating System" makes use of Bluetooth technology. The objective of the study is to develop a switch that can connect and disconnect appliances automatically. The end users can automate the switchover by using Bluetooth. Let's say a user decides to turn off a light remotely via Bluetooth. Before turning off the current and voltage supply to the light,

which turns it off, Arduino instructs the L293D motor driver to turn the N20 gear motor, which will be utilized to implement the toggle mechanism.

The user can quickly access all of this data whenever needed because it has been recorded. The times when the fan and/or lights were on or off each day are also included. By connecting it to the Arduino UNO, this smart switch may be used to automate a number of home appliances, including as fans and lights. A simple, adaptive, and intelligent user interface is provided by "home robotization with smart switch scheme," which enhances lifestyle. To benefit everyone with the least amount of effort and under various conditions, we must make use of contemporary advancements and technology. This strategy not only reduces the demand for human work but also ensures energy efficiency. Additionally, the project intends to lessen energy consumption losses brought on by concealed elderly and disabled people switch automation with Bluetooth integration allows people to live more freely because they can operate the switch from anywhere. The entire action of the switch is regulated and synchronized by the N20 gear motor with bolt mechanism. The project that is being presented is mechatronics-based. The Arduino software IDE is used to programme each of these functionalities, making it more simpler to write code and upload it to the microcontroller.

## 2. LITERATURE SURVEY

[1] NaveenKumar K, Srinivasan. P, Gowri Prasad. S, Arjun. M, Prem Kumar. R was built this project. Authors offered a solution in this paper that will be very helpful in attaining to control various electronic appliances. One microcontroller is used to control all of these electrical and electronic gadgets. It has several RF transmitters and a microcontroller as the main memory, both of which are used to operate numerous home appliances. Manual switches, Android applications, and voice assistants can all be used to control it. The Android app displays the switch's status, including whether it is on or off. By alerting the user to connections that are turned on unnecessarily, the application makes sure that power is handled effectively. This aids in energy conservation, and monitoring. The concept behind this automatic switching is that voice assistants or mobile applications are the only ways to control automated switches currently on the market.

This project intended to use voice assistants and mobile applications in addition to manual control. In contrast to manual switching, automatic switching can be carried out as frequently as required. Additionally, to reduce power interruption, an automated switch can immediately separate faulty network segments. Due to computer control and remote connectivity, the time needed for these switching processes may only take a few seconds. The main advantage of the automated technique is that it delays the installation of a new substation and all related costs until substantially bigger future loads are anticipated. Even people from middle class can afford it because of its affordable price.

[2] Tirupathi. Shrestha, Tummalapalli. Tanuja. The Smart Switch can be linked to the internet via Wi-Fi, a web-enabled computer tablet, a contemporary phone, or any other device. This paper outlines the development of firmware for a "Smart Switch (SS)" that could control the "on-off" of any electrical device at home via the internet. The system, the security, the user's potential passphrase creation, and the user's choice in programmed mode are all produced. The SS must be restarted after this information has been delivered and saved in order to establish a connection to the internet and enable the user to control the smart switch by text message. Whether you utilise the primary or the number zero to switch, this system works on a fundamental level.

However, it should be possible without using the internet, i.e. by working with a local business. While keeping in mind the end purpose, the SS can be connected to the internet using contemporary mobile technologies, Wi-Fi, a PC, iPad, or any other web-enabled device..

[3] Lalit Mohan Satapathy, Samir Kumar Bastia Nihar Mohanty worked on this research. In this work, they have proposed a home automation system that makes use of an esp8266-01 connection module and an Arduino UNO microcontroller to show the efficiency and viability of the system. The system first verifies the connections and modules through Arduino programming. The system will signal an ERROR status if it detects any form of error. If no errors are discovered, the system will display a status of OK and move through with connecting to the local Wi-Fi. At this point, the system will once more verify that the ESP8266-01 module is linked to the internet. If there is no connection, the system will display the status ERROR or, alternatively, SYSTEM ONLINE with the IP address. After receiving the command, the system will wait for the signal before switching the load and updating the display. It enables the user to remotely manage a variety of appliances, including lights, fans, and televisions, and make

decisions based on sensor feedback. They experimented with technology under various environmental circumstances in order to test it.

[4] Dr K Ramesh Babu , Mr. Ayinadis , Getahun , Engida , Mr Missay. Mangesthu developed this project. A home that uses Bluetooth for house automation has a communications network connecting its electrical services and appliances, allowing for remote access, monitoring, and control. Many methods are used in the house automation system to accomplish several goals including enabling older people to lead life more independently and also improving daily comfort for people with disabilities. The system's architecture is based on the Arduino Microcontroller and uses the C/C++ programming

language. In various monitoring and control procedures, there are two technologies used: Bluetooth and infrared (IR). The Android application was created using the MIT App Inventor Developer and is connected to an Arduino Mega through the HC-05 Bluetooth module. Using an Arduino digital signal, they have operate relays. The various home appliances is controlled by the relay. An Android app and a Bluetooth module is used to operate the entire system, providing a user-friendly interface. Wires ought to be attached on one end to a power plug for a device such as lamp, fan, television, etc. In this designed project, they have just covered a very basic prototype, but it can be expanded into a lot more things in the future.

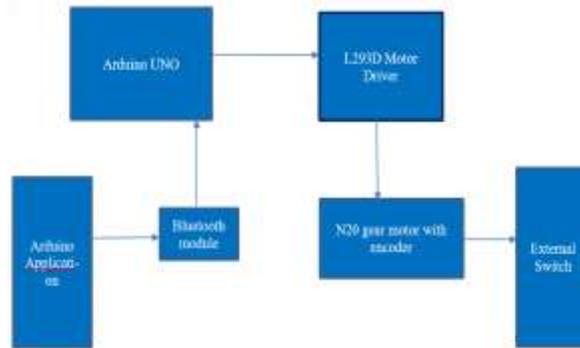
[5] Vinyl Ho Oquino , Tadesse Hailu Ayane , Temesgen Bailie Workie & Simegne Yihunie Alaba built this project. The specific objectives of the research project include assessing the electrical system currently in use in the area, designing the electronic circuit for the automated control switch, simulating the design model circuit, developing the prototype hardware circuit, testing the efficiency of the automated electronic switch, and calculating energy savings and system efficacy. Significant advantages of the project included automation of the control of all electrical power within the designated room, a decrease in energy consumption losses caused by misunderstanding the status of manual controllers, and a low implementation cost due to the use of locally available materials.

### 3. COMPONENTS AND METHODOLOGY

Huge research has been carried out in the automation field and many researchers are also working on automation system. Many research was carried out and automation using different methodologies. Switch automation system will automate the electronic and electrical appliances. Designing a system that disconnects the connected appliances from the line in the absence of nearby customers, in an efficient manner is one of the largest issues faced by electrical engineers in the nation.

Due to the differences in motor technology, different motors were used initially and tested. At the beginning we tried with relay modules to automate the switch in which we learnt that the switch automation using relay modules requires a lot of internal wiring hence we researched for other best technique which has to be both unique as well as it has to prove to be beneficial in terms of energy consumption, wiring etc., After researching we planned to try the automation with stepper motor, which will reduce the wiring for automation but stepper motor also had many drawbacks, few of them are stepper motor was having low efficiency and was having a really low torque .

Later after deep reaserch based on different motors and their mechanism we decided to use N20 Gear Motor with encoder with was best in solving the previous two problems. This motor proved to be a best solution for our previous problems regarding motor. This N20 gear motor was very good in torque and speed control, to control the motor we have used encoder with it. Other important components are Arduino UNO and L293D motor driver with are interfaced with the gear motor , we have also used Hc-05 bluetooth module to control the designed model through android application.

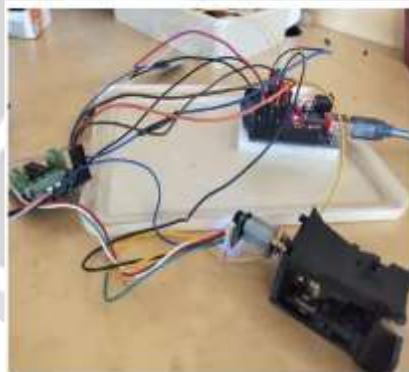


**Fig [1]** Block diagram of the entire working

The system's general functionality is shown in the block diagram above. To control the switch, an Android Arduino application that interfaces with a Bluetooth module is utilised. Bluetooth which is utilised in various monitoring and control activities, are all incorporated into the system architecture, Programming for the same is done using an Arduino Uno board. Programming is done using embedded C in Arduino IDE platform which is based on an Arduino Microcontroller.

Arduino UNO is later interfaced with L293D motor driver which is used to communicate between Arduino UNO and gear motor, this setup is later connected to the external switch to automate the switch, this is the overview of our designed model "Modular Actuating System"

Multiple form of control system for home automation is being implemented using a combination of hardware and software technologies in this project. Signals are sent to the HC-05 bluetooth module in the same network via an Android phone. All of the GUI (Graphical User Interface) buttons for each appliance are available in the Android application. The Arduino board and gear motor are controlled by the Bluetooth module after receiving the signal from the smart phone application. This allows for the on/off switching of appliances. The Arduino receives the signal from the Bluetooth module and analyses the data at the very end, making it simple for the end user to control home appliances.



**Fig [2]** Built model

#### 4. DESIGN

To implement the modular actuating system we have used n20 gear motor interfacing it with Arduino UNO and L293D motor driver. Initially the gear motor is fixed with external nuts and bolts to it. By creating a overall casing structure using 3d printer to the system and modulating mechanism provide the external support to actuate the system. By using the simple to and fro mechanism we have implemented the triggering of the modulating system with interfaced Arduino Bluetooth app for accessing it through a wireless device and it is with the help of Bluetooth hc05 module is connected to the circuit to establish this wireless serial communication.

#### 5. CONCLUSIONS

This paper focuses on several remote operating or control methods for electrical and electronic appliances using an Arduino, a gear motor, a motor driver, a bolt, and a screw. Smart switches created here may be operated manually in addition to using Bluetooth. The experimental set-up that we created is focused on controlling various home appliances with 100% efficiency.

The implementation consists of an Arduino Mega and an Android phone with home automation software. The project is built with unique idea of automating and also has great future scope.

#### 6. REFERENCES

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