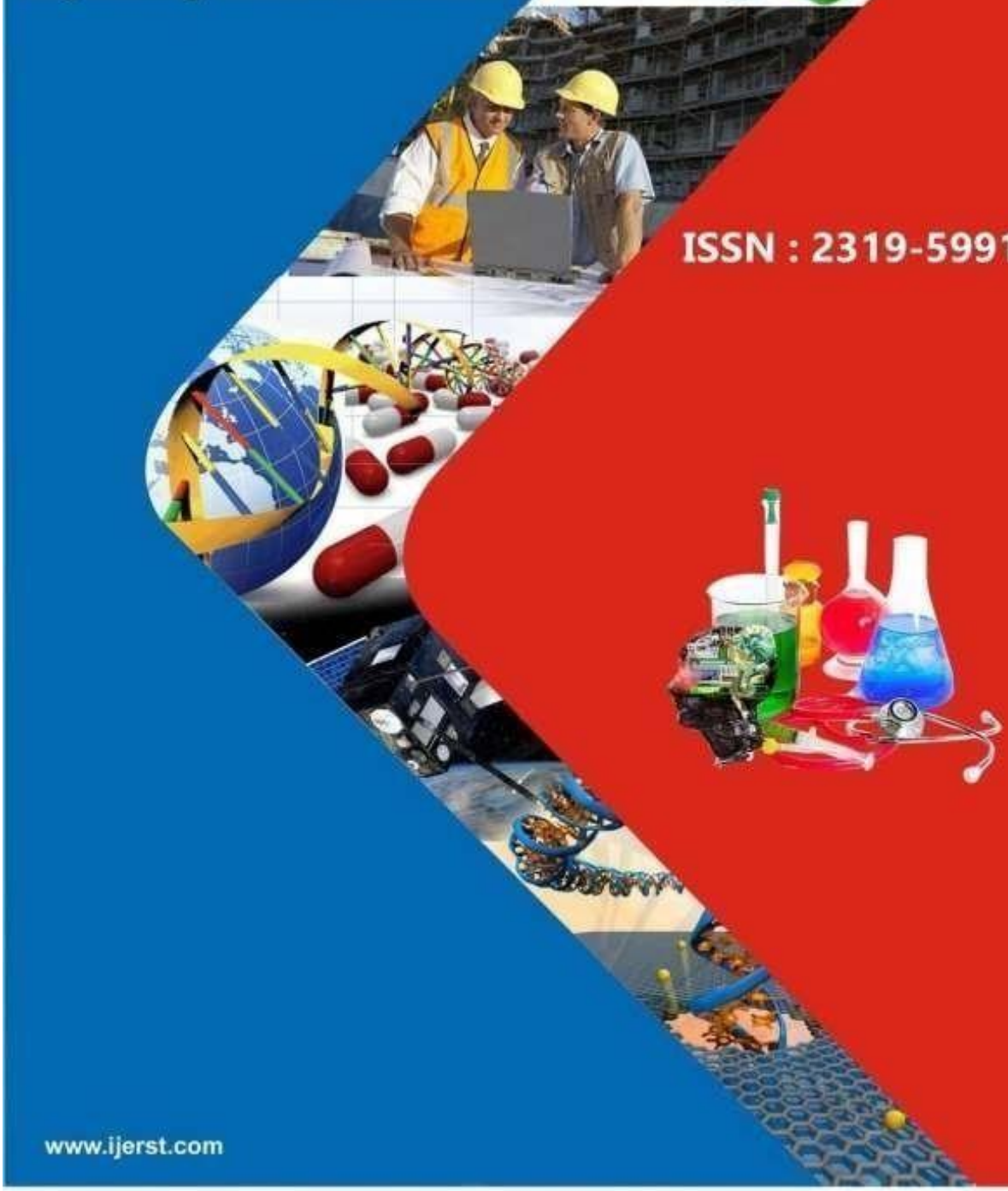
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ASTUTE POWER OPTIMIZERS

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ABSTRACT

In today's fast-evolving technological landscape, the demand for convenience and efficiency in home management is ever-increasing. This project focuses on the development of a sophisticated home automation system utilizing Wi-Fi technology. The primary objective is to enable users to remotely control and monitor household devices using a personal computer (PC) or mobile device, significantly enhancing convenience, safety, and energy efficiency.

The system architecture is centered around the Arduino UNO microcontroller, integrated with the ESP8266 Wi-Fi module. This setup allows for seamless communication between the user interface and the home appliances. Users can send commands over a Wi-Fi network, which the Arduino processes to control various devices through relay switches. This system supports standard Wi-Fi frequencies (2.4 GHz) and ensures reliable data transmission speeds (1-2 Mbps) with an operational range of 40-300 feet, making it suitable for typical home environments.

In conclusion, this home automation system exemplifies how modern technology can be leveraged to create safer, more efficient, and user-friendly home environments. The successful implementation highlights the potential of Wi-Fi-based automation systems to revolutionize residential living by offering scalable and adaptable solutions to meet the evolving needs of homeowners.

I. INTRODUCTION

In today’s fast changing world, everything is becoming compact, portable and mobile. The mobile handsets for communication are the biggest advancement in the area. These have made our lives much simpler and connected. Today almost everyone is familiar with it’s usage, and is able to draw advantage from it. The technologies for mobile communication have been ever evolving. Each had there share of pro’s and con’s. The WIFI esp 8266 represents the second generation of mobile communications. It is a digital telephony system, used in most parts of the world, starting from Finland in 1991 till now, with

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Vol. 20, Issue 2, 2024

more than 690 mobile networks providing WIFI services across 213 countries.

The project aims at designing an advanced home automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF and sensors can be read using a Personal Computer (PC) through Wi-Fi. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house. Wi-Fi (Short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet. The controlling device for the automation in the project is a Arduino UNO. The data sent from PC over Wi-Fi will be received by Wi-Fi module connected to Arduino UNO. Arduino UNO reads the data and decides the switching action of electrical devices connected to it through Relays.

PROBLEM STATEMENT

Technology has advanced so much in the last decade or two that it has made life more efficient and comfortable. The comfort of being able to take control of devices from one particular location has become imperative as it saves a lot of time and effort. There for there arises a need to do so in a systematic manner which we have tried to implement with our system. The system we have proposed is an extended approach to automating a control system. The application of our system comes in handy when people who forget to do simple things such as turn ON or OFF devices at their home or in their office, they can now do so without their presence by the transmission of a simple text message from their mobile phone.

OBJECTIVE

The primary objective of this project is to develop an advanced home automation system that enables users to have comprehensive control over all remotely controllable aspects of their homes. The system aims to leverage Wi-Fi technology and a central host PC to facilitate this control, offering both local and remote access via the Internet and a Pocket PC application based on Windows Mobile.

1. Centralized Control:

The system will allow users to manage home appliances and devices through a central host PC. This centralized control ensures that

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Vol. 20, Issue 2, 2024

users can monitor and control multiple devices from a single interface, enhancing the convenience and efficiency of home management.

2. Remote Accessibility:

One of the significant aspects of this home automation system is its ability to be accessed remotely. Users can control and monitor their home devices via the Internet, providing them with the flexibility to manage their home environment from anywhere in the world. This remote accessibility is further extended to a Pocket PC with a Windows Mobile-based application, ensuring that users have control at their fingertips even when they are on the move.

3. Integration with Existing Technologies:

The project utilizes the Arduino UNO microcontroller as the core component for automation. Data sent from the PC over Wi-Fi will be received by a Wi-Fi module connected to the Arduino UNO. The microcontroller then processes this data to perform the required switching actions on connected electrical devices through relays. This integration with existing and widely available technologies like Wi-Fi and Arduino ensures that the system is cost-effective and easy to implement.

4. User-Friendly Interface:

A significant emphasis is placed on creating a user-friendly interface that simplifies the process of home automation. By replacing conventional switches that can produce sparks and pose fire hazards, this system aims to provide a safer and more reliable alternative for controlling home appliances.

II.LITERATURE SURVEY

"Design and Implementation of Home Automation System"

Home automation system achieved great popularity in the last decades as it increases the comfort and quality of life. Smartphone applications are used to control and monitor the home appliances using different types of communication techniques. As mobile devices continue to grow in popularity and functionality, the demand for advanced ubiquitous mobile applications in our daily lives also increases. The paper deals with the design and implementation of a flexible and low-cost Home Automation System for various mobile devices that leverages mobile echnology to provide essential unctionalities to our homes and associated control operations. In particular, with the help of mobile devices, the device manages operations on home appliances, such as turning ON/OFF a television or microwave or altering the intensity of lighting around the house. The device has three ways of communicating with home appliances. First is through Apple Home app, which runs on iOS 10 or later, and lets you securely control smart home devices or any home appliance as long as the device is added in the Apple HomeKit as an accessory.

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 20, Issue 2, 2024

The second way is through the means of an Android app. And lastly, the application is not only limited to smartphones but also can be used by feature phones through web browser.

"Voice-Activated Environmental Control System for Persons with Disabilities"

The paper outlines the development of a voice-activated environmental control system designed to assist individuals with disabilities such as quadriplegia, paraplegia, or cerebral palsy. This system integrates a universal remote control with X10 home automation technology, which allows for wireless control of various household devices. The core of the system is a Motorola 6811 microprocessor, which serves as the central processing unit. Additionally, the system includes a commercially available voice recognition circuit, enabling users to operate the control system through voice commands. This combination of technologies aims to provide greater independence and ease of use for individuals with mobility impairments.

"An Internet-Based Educational Control Systems Lab Using Net-meeting"

The home automation today needs to make use of the latest technological components available. In this paper, we present the design and implementation of a home automation system where communication technologies GSM (Global System for Mobile Communication), Internet, and speech recognition have been used. All these techniques are uccessfully merged in a single wireless home automation system. This system offers a complete, low cost, powerful and user friendly way of real-time monitoring and remote control of a house

III HARDWARE DISCRIPTION:

Arduino

- **Description**: A versatile microcontroller platform used for building electronics projects. It can read inputs (e.g., light sensor) and control outputs (e.g., turning on a motor).
- **Example**: Arduino Uno, Arduino Mega, Arduino Nano.

WiFi Module

A module that adds WiFi connectivity to the Arduino, allowing it to communicate wirelessly with other devices and the internet.

- **Example**: ESP8266, ESP32.

LCD

A Liquid Crystal Display used to provide a visual interface for the user, displaying information such as system status, sensor readings, or user prompts.

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 20, Issue 2, 2024

16x2 LCD (16 characters per line, 2 lines) or 20x4 LCD (20 characters per line, 4 lines), often with an I2C interface to simplify wiring.

Power Supply

Provides the necessary electrical power for the Arduino and its connected components. It converts AC from the wall outlet to the required DC voltage.

5V DC power supply for Arduino and peripherals; 12V or 24V power supply for high-power components if needed.

· **AT Command Supporting WiFi Mobile Phone**

A smartphone that can send AT commands over WiFi to control the Arduino or WiFi module. This is useful for testing and controlling the system via mobile phone.

Most modern smartphones with a terminal application that can send AT commands over a network.

Relays

Electrically operated switches that allow the Arduino to control high-voltage devices like bulbs. A small control signal from the Arduino can switch on/off a larger electrical load.

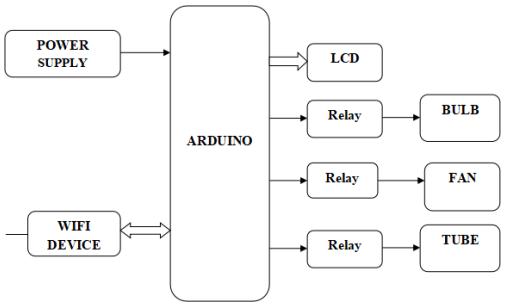
Relay modules (e.g., 4-channel or 8-channel relay module).

Bulbs

The electrical loads controlled by the relays, used as the end devices in the project. These can be regular incandescent bulbs or energy-efficient LED bulbs.

- **Example**: LED bulbs or incandescent bulbs with specifications matching the relay module's capacity.

IV. BLOCK DIAGRAM:



WORKING:

The idea behind this project is to use the existing WIFI infrastructure. So, all the operations involve the WIFI system also. As we send any SMS, it goes through the WIFI system. Any sent SMS can be received if we use a SIM card and WIFI module. To operate any WIFI modem, we have to use the AT commands to operate them. For example, if any SMS arrives the WIFI modem sends the serial data in ASCII format. We can read these data if we connect the modem with the serial port of the microcontroller at the baud rate of 9600. As the microcontroller comes to know that a SMS has been arrived, it can sent a proper AT command to read the SMS. The reading of SMS returns the mobile no of

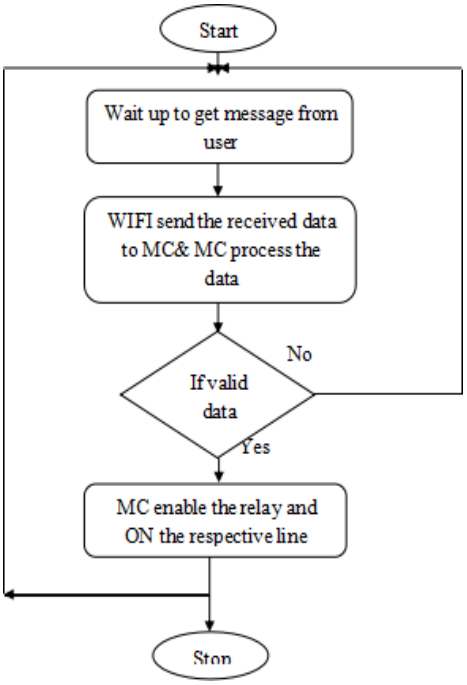
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ISSN 2319-5991 www.ijerst.com

Vol. 20, Issue 2, 2024

sender, the time and much more information. We have to select the SMS part of the message. The starting string of the SMS is used as the password. As the password is matched, then the SMS arrival is assumed to be valid by the microcontroller otherwise, it ignores the SMS. If the SMS is valid the controller enable respective relay then the load will be on and the status will be displayed on LCD. Working of "EMBEDDED SYSTEM FOR HOME AUTOMATION USING SMS" is very simple.

V. FLOW CHART:



VI. CONCLUSION

This paper presents the design and the implementation of an interactive home automation system with the WIFI, the Internet accessibility and the speech features. The Internet provides access the full features of the system through an interactive Web interface. As the mobility in the world increases, the need to control home from remote locations also increases. The monopolistic power distribution market in Asia is gradually transforming into a competitive marketplace. This system implementation is easy to implement wherever we feel necessary especially in the places like rural areas. The WIFI is an excellent choice for this due to its extensive coverage. Since SMS is a text based protocol, even the most basic WIFI systems can have an access to the status of the devices or make changes on these states. The speech makes the system an excellent choice for the motion disabled.

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