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Security Monitoring and Self-Control System for Home

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Abstract *–In this paper with the increase in energy consumption and population, there is a grave need to conserve energy in every way possible. The inability to access and control the appliances from remote locations is one of the significant reasons for energy loss. The users use a web or an Android application to instruct these systems. This system can use various communication methods such as Wi-Fi, GSM, Bluetooth, and Zig Bee. Different controlling devices and configurations can be found in existing systems. Such systems have already been found in many places for various applications. This project presents a home automation system using Wi-Fi, an Android application and google firebase. It's a real-time database system.*

Keywords- Embedded Systems, Remote access Systems, Mobile Applications, Web Applications and Home Automation System

I. INTRODUCTION

The main idea of this design is to develop a home automation system using an Arduino IDE with WIFI being ever controlled by any Android smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradationally shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, the house's traditional wall switches are scattered along various hallways, making it dangerous for a person to approach them and utilize them. Indeed, more it becomes more delicate for the senior or physically hindered people to do so. Remote controlled home automation system provides a most modern result with smart phones. In order to achieve this, a WIFI microcontroller is programmed with the Arduino IDE. At the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/ OFF commands to the receiver where loads are connected. By touching the specified position on the GUI, the loads can be turned ON/ OFF ever through this technology. The loads are operated by relay through optoisolators and ULN2003 relay driver.

II. LITERATURE REVIEW

Existing home automation systems have traditionally relied on manual control methods, requiring homeowners to operate various devices individually [1]. This limitation prompted the development of wireless sensor networks to automate and enhance home security [2].A paper proposes the use of IoT-enabled devices and wireless communication networks to create a comprehensive home automation system [3]. This system allows homeowners to control various aspects of their homes, such as lighting, temperature, and security, remotely through mobile applications. Another study explores the integration of artificial intelligence (AI) technologies into home security systems [4]. By incorporating AI algorithms, the system can analyze and identify potential threats, such as unauthorized access or suspicious activities, and notify homeowners or security personnel accordingly. The advancement of smart home technologies has led to the development of voice-controlled home automation systems [5]. Through natural language processing and voice recognition, homeowners can interact with their smart devices and control home functions simply by issuing voice commands. Paper [6] proposes the utilization of video surveillance systems and motion detection sensors to enhance home security. These systems can detect intrusions, monitor activities, and provide real-time alerts to homeowners or security services. The emergence of smart locks and biometric authentication

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technologies has significantly improved home security [7]. These systems utilize fingerprint or facial recognition to grant access, eliminating the need for traditional keys and enhancing the overall safety of homes. The integration of cloud computing technology into home automation systems enables centralized control and monitoring [8]. Homeowners can access and manage their smart devices and security systems remotely, enhancing convenience and flexibility. One research study focuses on the development of a scalable and interoperable framework for home automation and security. This framework aims to integrate diverse devices and protocols, ensuring seamless communication and compatibility between different components of the system.

III. PROPOSED SYSTEM

The project aims to develop a home automation system that utilizes the Arduino IDE and Wi-Fi technology to enable control through an Android smartphone. The primary objective is to enhance the functionality of modern houses by replacing conventional wall switches with a centralized control system and remote-controlled switches. This system is particularly beneficial for individuals with limited mobility or seniors who may find it challenging to operate switches located in different parts of the house.

a)Hardware Structure

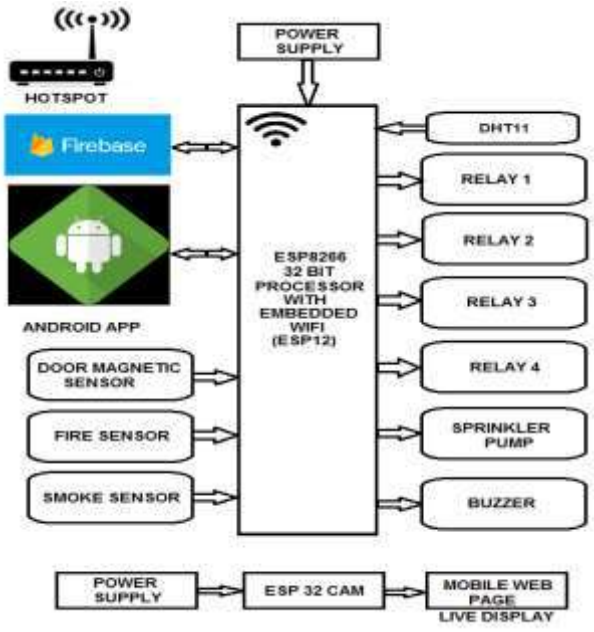

Fig No.01 shows the diagram of proposed system

ESP-12E:ESP-12E is a low power consumption of the UART-Wi-Fi module, with very competitive prices in the industry and ultra-low power consumption technology, designed specifically for mobile devices and IOT applications, user's physical device can be connected to a Wi-Fi wireless network, Internet or intranet communication and networking capabilities. ESP-07 the use of small ceramic antenna package can support IPEX interface. Users have a variety of installation options.

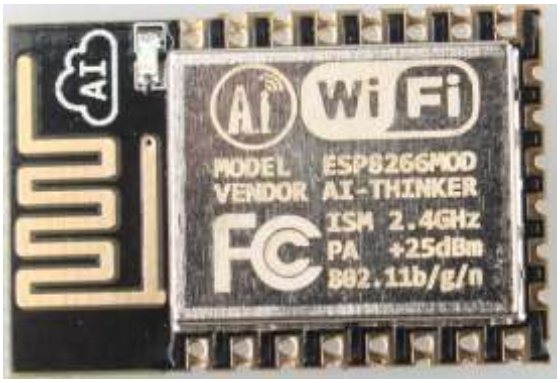

Fig No.02 ESP-12E

ULN2003: The ULx200xA devices are high-voltage, high-current Darlington transistor arrays. Each consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs can be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. For 100-V (otherwise interchangeable) versions of the ULx2003A devices. The ULx2003A devices have a 2.7-kΩ series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS devices.

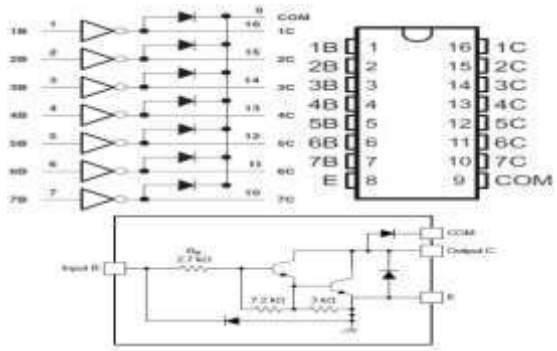

Fig No.03 ULN2003

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Temperature Sensor & Humidity Sensor

(DHT11): The DHT11 humidity and temperature is a type of sensor which is used to measure the humidity and temperature of environment with accuracy. After sensing the respective parameters, it provides output to controller. Humidity Range: 20-90% RH, Temperature Range: 0-50°C

Fig No.04 shows the Temperature and Humidity sensor

ESP32-CAM:ESP32-CAM is a low-cost ESP32-based development board with onboard camera, small in size. It is an ideal solution for IoT application, prototypes constructions and DIY projects. The board integrates Wi-Fi, traditional Bluetooth and low power BLE, with 2 high-performance 32-bit LX6 CPUs. It adopts 7-stage pipeline architecture, on-chip sensor, Hall sensor, temperature sensor and so on, and its main frequency adjustment ranges from 80MHz to 240MHz.

Fig No.05 Esp32 cam module

Buzzer: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke

Fig No.06 Buzzer

Fire Sensor: A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. So, this sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in firefighting robots like as a flame alarm.

Fig No.07 Fire sensor

Sprinkler pump: A sprinkler pump is a part of a fire sprinkler system's water supply and powered by electric, diesel or steam. The pump intake is either connected to the public underground water supply piping, or a static water source (e.g., tank, reservoir, lake).

Fig No.08 Sprinkle pump

Smoke sensor: A smoke detector is an electronic fire-protection device that automatically senses the presence of smoke, as a key indication of fire, and sounds a warning to building occupants. Commercial and industrial smoke detectors issue a signal to a fire alarm control panel as part of a building's central fire alarm system.

Fig No.09 Smoke Sensor

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Operational Flow Chart:

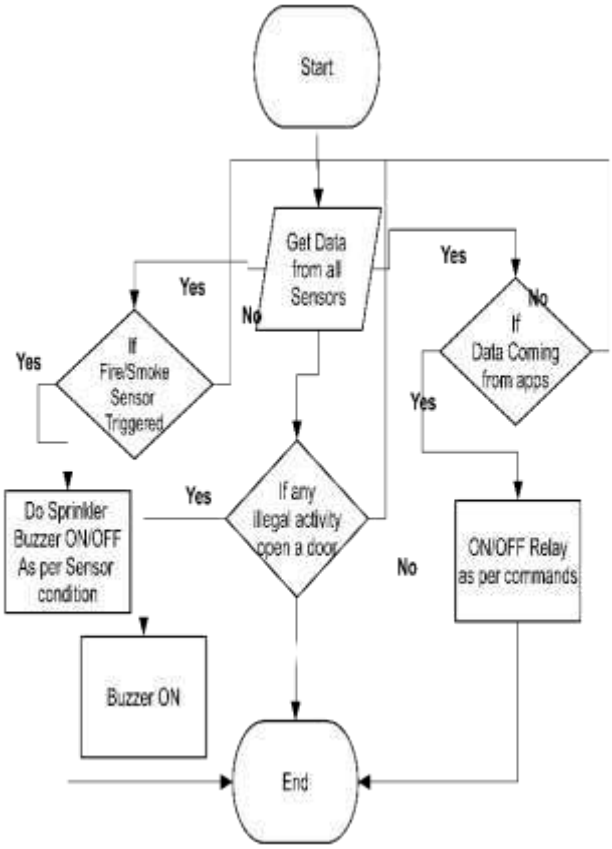

Fig No.10 Operation Flow Chart

IV. RESULT & DISCUSSION

Fig No.11 Test-1

Test-1 Door open Check

Result - Door open alert on android and buzzing sound from Buzz

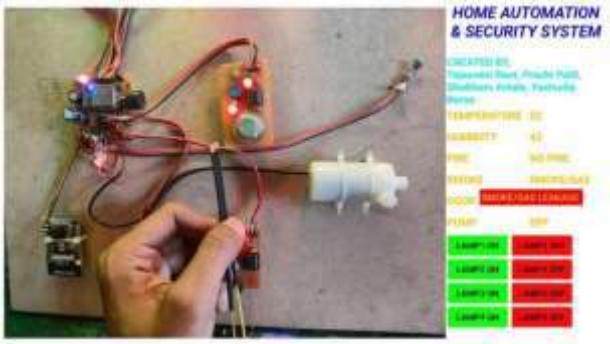

Fig No.12 Test-2

Test -2 Gas leakage check

Result - Alert on Android application and turn on of sprinkler

Fig No 13 Final Propose Project

V. CONCLUSION

Based on all the systems surveyed and their advantages and drawbacks, this project presents the features of an ideal system for home automation with remote access. An ideal design should be available from all over the world to a user in real time. An internet network is identified as a candidate for this, Only the Internet can guarantee that access is always available. This will give

rise to a standard access method for domestic appliances using the Internet protocol. The user interface should be associated mobile application. So that individuals of all kinds can access the system. Additionally, such a system must to be straightforward to install. Only then can automated dwellings become commercially viable. The design of the user interface for these applications needs to be given a lot of care. Plug-and-play capabilities will be a benefit for the system. The ease of adding a new device to an automated house will play an essential role in carrying forward the designs commercially.

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