

AUTOMATED SECURITY SYSTEMS

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ABSTRACT

Nowadays people look for both comfort and secure life whether it is in the house or the workplace as well. The automation system is an advancement in today's technology which is used for controlling home appliances from a far distance to reduce efforts. Security mechanism which has become an important part in today's society is generally used to protect the place. The demand is increasing day by day as it is capable of reducing human work, save daily electricity and also helps to reduce worries about security for families while at work. The focus of this project is to give insights into both automation and security system, which allows us to control door OPEN/LOCK status, gas leakage, and temperature status. There have been many technologies used before and mobile plays a crucial role to control the equipment used in both automation and security system. Through this basic idea, we are trying to bring a safe and monitored view of automation and security systems by making sure that the user is always in control of the house or a vehicle whether it is a city, village or in remote areas.

Keywords: Security Systems, Automation Systems, Global Positioning System (GPS), Global System for Mobile (GSM), NodeMCU

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1. INTRODUCTION

Technology has shown improvement when it comes to security systems over a short period with the addition of control by smartphone and usage of microcontrollers and Graphics Processing Unit (GPU) based microprocessors. Automation systems include features to make life easy. It allows controlling appliances using smartphones from a distance whether it is an office or home, and it is due to wireless communication being effective. Accidents at a high rate were reported due to gas leakages or due to fire in factories, houses, etc. In those situations, people cannot afford to do much and wait for emergency services for the rescue. An object can be of any type like home appliances and other household things or a vehicle for the anti-theft purpose. In IoT distance is not a major factor. The main reason to use this technology in this project. By using IoT Smart home has been designed, which has four applications that use a smartphone to give appraisal to the owner. The project idea overcomes the shortcomings of security systems by providing information about the situation when the owner of the house or in the workplace is

away. This will also enhance the IoT's network security with the help of encryption and decryption of the user's data.

This paper is divided into further small parts organized as follows:-

Section II aims for the work done by many papers in previous years in the field of both Automation and Security Systems. Section III describes the schematic block diagram and also the procedure through which the whole paper works accordingly. Section IV represents the system been implemented and has in-depth detail about the working of components used in the system. Section V expresses the flow of operations in the system and some modifications which can be done to bring effectiveness in automation & security systems. Section VI concludes the paper with the future scope and the implementations of the idea which is reflected in the paper.

2. LITERATURE SURVEY

Ashwini Pawar and V M Umale in the year 2018 by using raspberry pi monitored the surroundings within the house and outside which requires the internet [1]. For IoT based home security, there is a requirement of some platform to connect the things and perform a program so they have selected the latest version of the raspberry pi model. The paper approach is to secure a home in terms of any damage and theft.

In the year 2015, Balakrishna Gokaraju suggested that the main purpose lies in cost and time effective communication of the intrusion event wirelessly to the homeowners and law-enforcement with a confirmed image of the scene during the intrusion event [2]. It aims to compare in terms of design and program implementation against both ARM microprocessors and ATMEGA microcontroller.

In the year 2012, Mansour H. Assaf studied that works where the normal security systems that mainly focuses on the thefts which are increasing and collecting facts about thefts fail by using technology (FPGA). [3].

In the year 2017, Mile Mrinal analyzed the implementation of a security system that uses Android mobile devices with the use of Bluetooth as a wireless connection protocol [4]. It allows users to operate a door, the temperature, and humidity, controlling light switches from a remote location.

In the year 2016, Intelligent Security System for Residential and Industrial Automation proposed by Mallesham Yerragolla represents a security system that can be useful for house and industry applications by using remote control techniques with wireless applications [5]. It includes an environment detection module, diagnosis module, appliance control modules, and robotic modules. Multiple sensors were used for the detection processes. This project was also tested during the absence of human-beings. In the case of unknown persons, photos were taken and information was sent to the owner.

In the year 2016, the project proposed by Ravi Kishore Kodali discusses a wireless system that sends message to the owner by using the web [6]. The alerts are sent to the user making the use of internet on his device.

In the year 2017, the paper proposed by Prathibha S R aims to make use of evolving technology, i.e. [7]. It uses IoT sensors because these sensors are capable of providing facts about their farms and help farmers to do efficient farming. The temperature has been monitored alongside humidity within the agricultural field through sensors & camera which captures images and hence sends that picture through MMS to farmers mobile using Wi-Fi.

In the year 2018, Shradha Somani reviewed security system [8]. The security system of the house is achieved by sending notifications to the user using the Internet in case of any intrusion, and it is used to ring the alarm. Home automation is utilized by using appropriate sensors

installed around the house. The sensor here used is Raspberry pi which can control electrical appliances and providing authentication and security to the user.

Tridha Chaudhuri explored a security system in the year 2018 by which one monitor home and implements an automated style of controlling home appliances with the help of human [9]. This paper provides a safer and more monitored view of Home Automation by making sure that the user is always in control of his house.

In the year 2018, Smart Home System examined by Vishakha D. Vaidya and Pinki Vishwakarma aims to deals with a comparative study of a smart home system based on technologies like GSM, Bluetooth, IoT, and PIC Microcontroller with ZigBee modulation as well as automation to control light ON/OFF status, fan speed, and other home appliances remotely [10].

3. PROPOSED SYSTEM MODEL

The systematic representation of the model with proper explanation is explained below:-

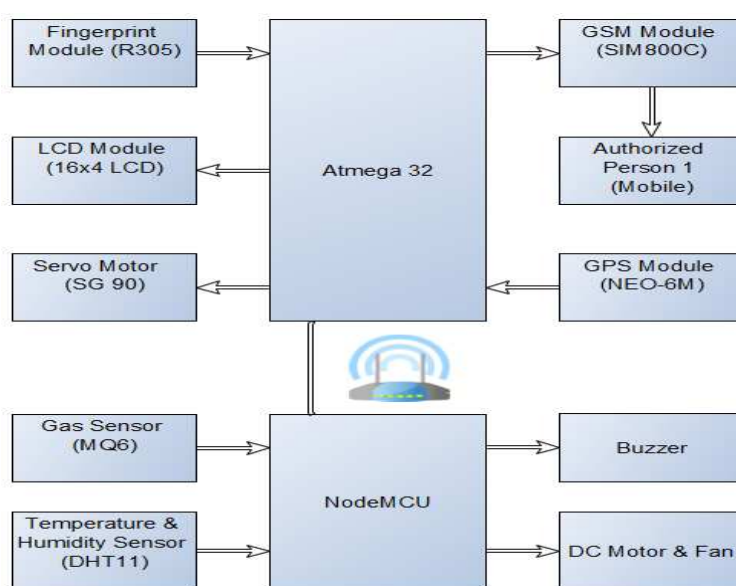


Figure 1 Block diagram of proposed system

In Figure-1, Fingerprint as the input is captured and if it is a registered user, the user is granted access and the same will be visible on the LCD. After the user is granted access, the message will go to the microcontroller i.e. NodeMCU and hence the automated door will be opened. Once the door is open, with the help of MQ6 (Gas Sensor) and DHT11 (Temperature and Humidity sensor), it will detect the gas leakage, temperature and humidity in real time and the information will be sent to the Blynk, an application shown in Figure-4. The user has access to the real time data. If the temperature increases more than 50°C, the DC Motor starts rotating and the buzzer will start ringing and emergency services will be intimated.

4. SYSTEM DESIGN

4.1. Description of Atmega32

An ATMEGA32 is an 8-Bit microcontroller which consists of 28 pins out of which 23 programmable I/O lines are I/O lines with read and write capabilities. Its operating voltage is from +1.8 to +5.5 (+5.5 being the absolute maximum). ATMEGA32 has a maximum clock speed of 20 MHz.

4.2. Description of NodeMCU (ESP8266)

NodeMCU integrates all components of a computer or other electronic systems. NodeMCU is an open-source platform whose hardware design is open for modification/editing/building/It consists of ESP8266 WiFi enable chip which is a low-cost WiFi chip. It lets us toggle at a clock speed of 80-160MHz.

4.3. Description of GSM Module (SIM800C)

The SIM800c is a Quad-band GSM/GPRS solution which delivers performances at 850/ 900/ 1800/ 1900 MHz and can be implemented in the customer applications. It is designed with a very powerful single-chip processor.

4.4. Description of GPS Module (NEO6M)

NEO-6M is a GPS module which is very popular, cost-effective, high-performance module. On board, it has a ceramic patch antenna, memory chip, and a backup battery which helps to connect with various microcontrollers. The This module has a UART interface with a baud rate of 9600 for serial communication.

4.5. Description of Fingerprint Module (R305)

R305 is a finger print sensor module with TTL UART interface. This module of capable of storing as well as comparing the fingerprint according to the user's desire. The user has an option to configure it in 1:1 or 1: N mode for identifying the person. The module can be directly interfaced with 3.3v or 5v Microcontroller and has a default baud rate 57600.

4.6. Description of Temperature & Humidity Sensor (DHT11)

The DHT11 is having a dedicated 8-bit microcontroller to serially send the values of temperature and humidity. The sensor monitors temperature up to 50°C and humidity till 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$.

4.7. DESCRIPTION OF GAS SENSOR (MQ6)

The module is used for detecting leakages of harmful and poisonous gases. The MQ-6 can detect gas concentrations in a range from 200 to 10000ppm.

4.8. Description of Servo Motor (SG90)

This module is 180° rotation servo which detects PWM signal operating at +5V and the angle of rotation can be set according to user's need.

4.9. Description of LCD Display (16x2)

Liquid Crystal Display is an electronic display module which makes use of liquid crystal to produce an image. The LCD Module has 16 Columns and 2 Rows having 32 characters in total where each character is made up of 5x7 Pixel Dots.

5. RESULTS AND DISCUSSIONS

The Atmega32 and NodeMCU are connected with various electronic components, sensors and LCDs as shown in Figure-2.

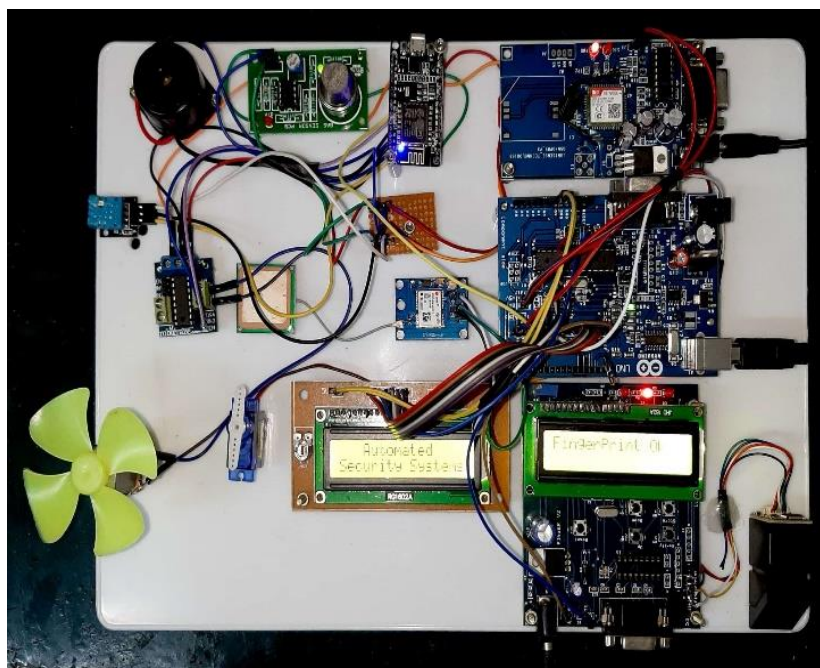


Figure 2 Implementation setup of Atmega32

The R305 Fingerprint Module captures the fingerprint of the user and compares it with the stored fingerprint database. If the fingerprint matches, the information is sent to Atmega32 where it processes the information and opens the door. The Atmega32 detects latitude and longitude through Neo-6m GPS Module and sends data to the owner's mobile making use of SIM800C GSM Module. The message received by the owner has information and location of the person in Google Maps accessing or trying to access whether it is a home, office, industry, factory and vehicle which is shown in Figure-3.

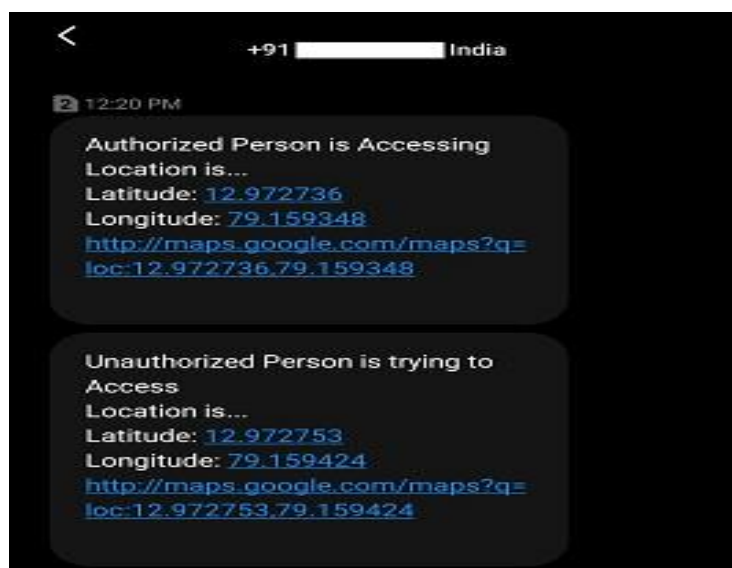


Figure 3 Received Message in Owner's Mobile

The DHT11 Temperature and Humidity Sensor and MQ 6 Gas Sensor which are connected to NodeMCU continuously detect the changes of surroundings and NodeMCU sends this data to Blynk. Figure-4 shows the various real time values and graph of temperature, humidity and gas leakage.

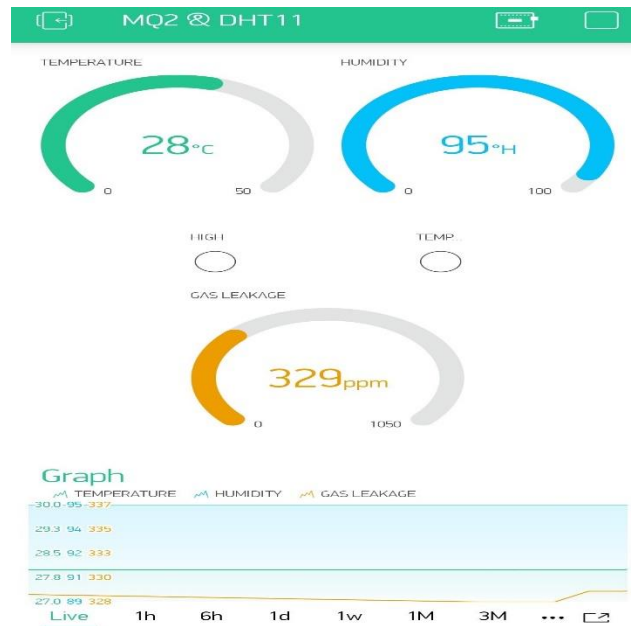


Figure 4 Graphs & Values of Temperature, Humidity and Gas Detection

If the temperature of the surrounding increases more than 50°C, the buzzer starts ringing as well as the DC Motor starts rotating.

Table 1 Comparative studies of the proposed model with previous models.

S. No.	Existing Model	Proposed Model
1.	Ashwini Pawar (2018) uses Raspberry Pi in their model which makes it less economical [1].	In our project with the application of NodeMCU and Atmega32 we have made our project cost effective and efficient to some extent.
2.	Balakrishna Gokaraju (2015) utilizes Wi-Fi for intruder detection and email is sent afterwards by the help of ARM microprocessor [2].	In our project with the usage of GSM & GPS System and by the help of Atmega32 microcontroller sends the information which can be accessed anywhere in the world through message and location in case of automobiles.
3.	Mansour H. Assaf (2012) aims on the development of a home security and monitoring system where user can use the system through a web page using internet [3].	In our project instead of using web-based interface we have used Blynk app which measures gas, humidity and temperature inside the house which has easy interface. The servomotor is used in this case with the help of fingerprint module to open the door which does not require remote control system.
4.	Mile Mrinal (2017) describes the use of a security system that uses mobile devices and its features as a wireless connection protocol [4].	In our project, the implementation of GSM and GPS overcomes the limitation of Bluetooth which is distance covered.
5.	Mallesham Yerragolla (2016) presents wireless applications using remote systems [5]. This project was also tested using different instances. In the case of unknown persons, proofs were taken and were sent to the owner.	In our project with the help of sensors and wireless communication covered an at least 1-5 km which can't be covered by remote control instruments. This project can be implemented in automobiles where the intruder's location is shown in google maps which is easy to access and camera is not required making it cost effective.
6.	Ravi Kishore Kodali (2016) builds a smart wireless home security system using Internet. The alerts and the status are sent by the Wi-Fi connected microcontroller managed system [6].	In our project with the help of fingerprint scanner and Global Positioning System and Global System (GPS) for Mobile (GSM) it eliminates the use of internet. It is especially useful in some areas where there is slow connection of internet for tracking location as only google maps is the only application which needs to be opened in case of vehicles.

S. No.	Existing Model	Proposed Model
7.	Prathibha S R (2017) focuses on the evolving technology i.e. IoT and smart agriculture using automation [7].	In our project with the help of dc fan and motor, we can reduce the temperature and humidity which helps to keep the crops alive for sometimes. The detection of higher temperature by the Blynk app will alert farmers and can give water accordingly.
8.	Shradha Somani (2018) makes a wireless home security system using the concepts of Internet of Things. The sensor here used is Raspberry pi [8].	In our project the user is allowed to do login with fingerprint scanning and usage of Atmega32 microcontroller and NodeMCU can reduce the cost taken by Raspberry pi to some extent.
9.	Tridha Chaudhuri (2018) presents a security system by which one can monitor and control one's home and implements an automated way of controlling home appliances by the help of human interaction and be able to monitor their home devices using their smartphones when connected to the same local area network [9].	In our project IoT concept can be used to connect different sources of information such as sensors, mobile phones, home and appliances in a firm. It could use a user Interface to make the system more interesting and does not require local area network as internet is a better option.
10.	Vishakha D. Vaidya (2018) deals with a comparative study of smart home system based on technologies which generally uses wireless communication with limited range [10].	In our project, GSM and GPS usage minimizes the limitation of Bluetooth, ZigBee. This project evaluates the comparison done in that project and implemented it accordingly to make it useful and cost effective.

6. CONCLUSION AND FUTURE SCOPE

This automated security system serves as a reliable and efficient system and corrective action can be taken. Continuous wireless monitoring reduces human power. It is economical in cost and consumes less power. The automated security system has been designed and synthesized. The developed system is more efficient and beneficial for all kinds of automated systems (Houses, cars, factory).

It gives the real time information about the temperature, humidity and gas leakage of the surrounding to the users, if there is a change from optimal range. The application of such system can definitely help advance the security systems and global production.

In future this system can be improved by adding several modern techniques like integrating the systems with a camera module using Raspberry Pi, integrating the systems with touch display units for better user interface, solar power source usage for efficient use of energy.

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