Smart Security System Using RFID and Camera Module for Home and Office

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Abstract: In this modern world, everyone wants their belongings to be safe and secure. People want to monitor their homes even when they are away from the place where they are. They want to monitor the home environment being miles away. So this system is proposed for all these purposes. There are many systems in the past that provide each of these features individually. In this paper, the proposed system can monitor the home and can provide immediate updates on whatever is happening. It perfectly distinguishes authorized and unauthorized persons and provides alerts not only by buzzer but also provides captured images of that person too. In addition to this, it alerts in case of fire and gas and also reduces the consumption of power by controlling lights.

It distinguishes the authorized using RFID module and if any unauthorized entry is spotted. It sends an alert to the owner with attached pictures. So, the probability of false alarms will be reduced. If anyone manages to enter the home by breaking the windows or doors and if such events are spotted by using vibration sensors, the owner will be intimated with the captured images using a camera (ESP32) and GSM module. It alerts in case of fire or gas which will be detected by fire (Flame sensor) and MQ6 gas sensor. It ensures enhanced protection by integrating all these features into a single project.

Keywords: RFID, Vibration sensors, Camera Module (ESP32), GSM Module, Flame sensor, MQ6 gas sensor.

I. INTRODUCTION

There is a high demand for security and safety devices nowadays. They are required to ensure safety and security in our homes and office. Security and safety are provided to ensure that the homes and offices do not become easy targets for burglars and intruders [1]. Doors and windows that are not locked and that are inadequately secured can provide easy access to our homes. Most intruders enter through unlocked doors. In this busy world, people have no time to secure their belongings. Hence, smart devices are needed to secure their homes. In recent years, most fire accidents occur due to gas leakage where a gas leakage problem turns into a huge fire accident [2,3].

The need for securing homes exists since ancient days. Techniques for protecting the households are door locks, barred windows. etc. Nowadays, security systems are all automated which can detect undesired situations occurring at home while the owners are being away. Advancements in
Technology made these security systems precise and more effective. The invention of electronic components like sensors, Arduino. etc. paved the way for the new era of security systems.
"Intelligent Alarm System to Protect Small, Valuable Items" an intelligent alarm system was proposed [4] to protect small and valuable items; like jewellery and other expensive, small size properties. The system utilizes machine learning techniques to intelligently detect threats, based on the environment data collected by different sensors and Arduino microcontroller, and then notify the owner by email message on a real-time basis. When received on the mobile phone, the email activates a unique notification alarm, so the user knows immediately about the threat.
In [5] proposed "RFID Smart card door lock". They designed a security system that provides access to the authorized individuals to enter. They installed a security system that included a door locking system that used passive RFID to activate, verify, and authorize the user and at the same time open the door for secure access.
Smart digital door lock for the Home Automation" was proposed in [8] A smart digital door lock system for home automation. A digital door lock system is equipment that uses digital information such as a secret code, semi-conductors, smart cards, and fingerprints as the method for authentication instead of the legacy key system. In this proposed system, a ZigBee module is embedded in a digital door lock and the door lock acts as a central main controller of the overall home automation system. Technically, the proposed system is a network of sensor nodes with a digital door lock as a base station.

In [10] a system was proposed which is controlled by an Arduino Uno microcontroller centrally. The microcontroller detects the output of Radio Frequency Identification (RFID), keypad 4x4, limit switch, Light Dependent Resistance (LDR) and Passive Infra-Red (PIR) for security of the door. The microcontroller will give a response when it detects the output from the sensors.
A response given by the microcontroller will control the Solenoid, Buzzer, Liquid Crystal Display (LCD) display, and lamp. The door will open if the data/password of RFID and Keypad 4x4 are appropriate. The buzzer will turn on when the limit switch detects an open door without using RFID and Keypad. The lamp will turn on automatically if conditions are dark and there is human movement in the room. The measurement uses a PIR sensor to detect the motion and LDR to measure the light condition.

In this paper section II shows the operation and drawbacks of the existing system. Section III explains the implementation of the proposed security system. The results of the proposed security system are discussed in Section IV followed by the conclusion and future scope.

II. EXISTING SYSTEM

Here the activation switch activates the whole Motion Detection Alarm System. Whenever the PIR sensor detects the motion of a person by measuring the changes in infrared levels due to the body temperature of the human body then it sends a signal to the microcontroller. Now the microcontroller activates the speaker such that an alert is given to the owner.
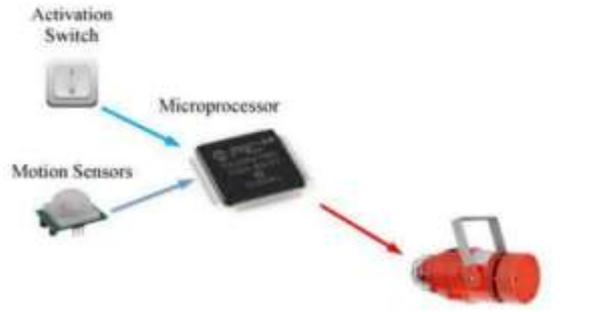

Fig. 1: Block diagram of burglary alarm system

The main drawback of this system is false alarms. This system fails to distinguish the authorized and unauthorized entry. The system starts buzzing even if the owner of the house enters when the alarm system is in active mode. In addition to this, it fails to alert the owner about the undesired situations at their home when they are miles away.

III. PROPOSED SYSTEM

The proposed system overcomes the drawbacks of the existing system. The block diagram of the existing system is shown in the below figure.
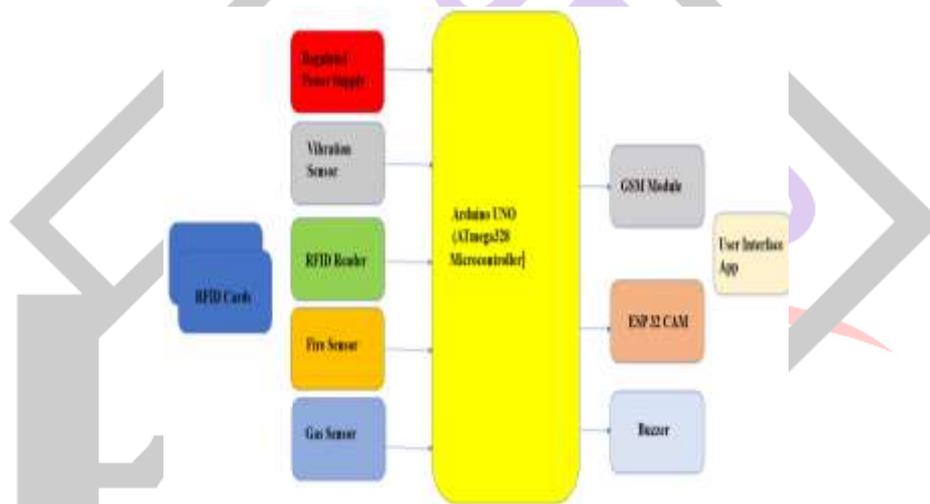
Fig. 2. Simple Block Diagram of the Proposed Method

A. System Operation:

The architecture of the Proposed system consists of mainly an RFID Module, ATmega328, MQ6 sensor, ESP32 Camera Module, and Flame Sensor.

RFID module consists of RFID tags and RFID readers. A module of Radiofrequency and an antenna coil constitute make up RFID reader. RFID Key cards generate signals of a particular frequency and transmit them to the reader. The reader analyses the scanned RFID key card and unlocks the door using Servomotor[4]. If after analysing the key card, the door remains closed then the buzzer gets activated and the camera module captures the image and sends it to the owner through GSM Module along with a text message and E-Mail. If gas or fire is detected, then the GSM module sends the text message and E-mail along with the images captured by ESP32 CAM. If someone tries to enter the home by breaking doors or windows, then the vibration sensor is used to detect such attempts and alerts the owner by providing captured images immediately.   So necessary action can be taken. This system also automated lights to conserve electricity.
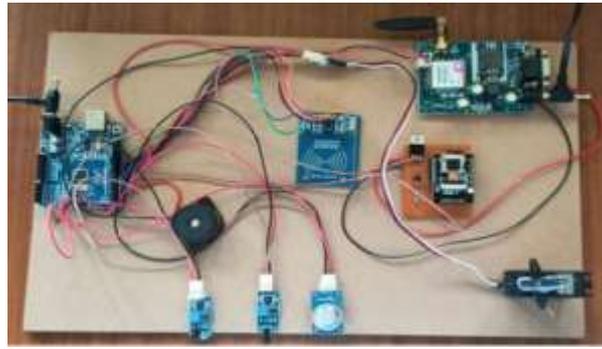
Fig. 3. Smart security system using RFID and camera module for home and office

IV. RESULTS
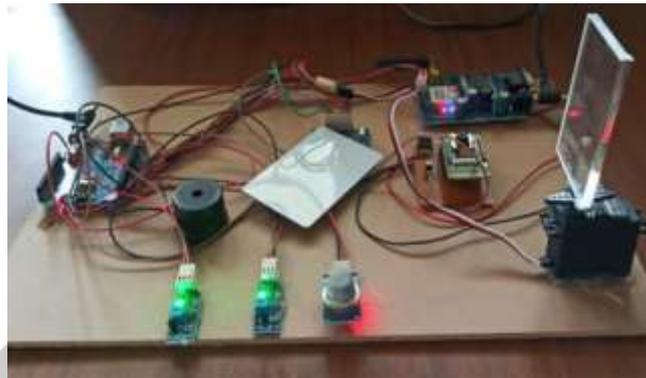
Fig. 4. Access to Authorized Person

If the person is an authorized one then the door opens for 3 seconds as shown in Fig. 4.
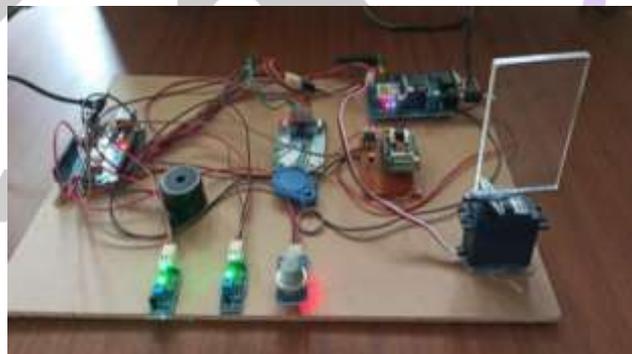

Fig. 5. Denied access to an unauthorized person

If the person is unauthorized, then the access is denied as shown in Fig. 5 an alert will be sent to the registered mobile number as "SOME-ONE TRYING TO ENTER THE RESTRICTED AREA" through GSM Module as shown in Fig 7.4 and along with that picture is sent to the registered Mail ID as "INTRUDER DETECTED" as shown in Fig. 6
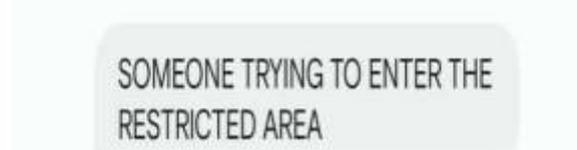
Fig. 6. Message sent by the GSM Module

Fig. 7. Mails are sent by the system along with captured images.

In the same manner, if persons enter by the back door or through the window then the vibrator sensor attached to them senses the vibration and the system sends an alert to the registered number as "SOMEONE TRYING TO ENTER THE RESTRICTED AREA" through GSM Module as shown in Fig. 6 and along with that picture is sent to the
Registered Mail ID as "INTRUDER DETECTED" as shown in the Fig. 8.
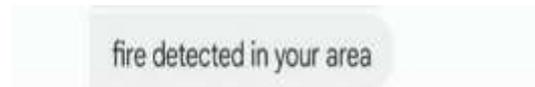
Fig. 8. Message sent by the GSM Module when the fire is detected
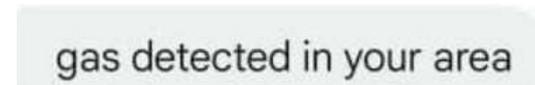
Fig. 9. Message sent by the GSM Module when gas is detected

The messages are sent in case of fire or gas leakage as shown in Fig. 8 and Fig. 9.

V. CONCLUSION

In the present hi-fi world, people want their belongings to be secure and they can monitor them from wherever they are. So our project not only provides security by buzzing alarms but also provides the owner with the camera pictures. So they can check whoever entering the house. Our project detects gas, and fire and also conserves power by automatic light control. As we are using a camera module, the chances of false alarms are reduced, and also succeeded in distinguishing authorized and unauthorized entry using the RFID module and servomotor mechanism. Our vibration sensor module detects if any breaking of doors or windows is spotted and alerts. All these features are integrated into one project to provide better security to the homes.

VI. FUTURE SCOPE

This system can be further developed by adding a water sprinkler in case of fire accidents and by adding gas suppressing systems for gas leakage conditions. These gas suppressors avoid fire accidents due to gas leakage by decreasing the oxygen content to 15% where most materials do not burn. Providing intruder information to the nearest police station is one more advancement no that can be made to this system. All these advancements can make this system a bit more effective and a better system for home and office security.

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