

Intrusion and Fire Detection System for Home Security using Mobile Application

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ABSTRACT

One of the main issues in people's daily lives today is security. Security concerns in the residential and commercial sectors have grown significantly as a result of everyone's desire to safeguard their investments against any kind of loss or destruction. Today's world is seeing an increase in the use of security technologies and smart applications. Microcontrollers with Global System for Mobile (GSM) Shield are used as sensors in the system. The ability to combine two different technology kinds makes security monitoring simpler. The goal of the study paper is to provide real-time notifications for prompt action in the event of a security disturbance. Smoke, motion, and attempted door opening will all be picked up by the system. Once an activity is detected, the sensor also sends an SMS signal to the device. As a signal of a detection event, the sensor and mobile device would produce an alarming sound, and the application would launch. The system features a mechanism for delivering text messages that allows the appropriate authorities to respond quickly. The results of the study will assist in easing homeowners' concerns about their own security. With the aid of this study, crime and fire accident rates could be reduced through timely text message reporting to the police. Additionally, it will assist in alerting the user whenever and wherever. A thorough, efficient, and well-organized system design was created. The created system manages fire detection and intrusion detection in the context of home security and is accurate, dependable, and efficient.

Keywords: *Intrusion, Microcontroller, Motion detector, Security System, Detection, SMS (Short Message Service) Technology.*

INTRODUCTION

One of the most effective, safest, and economical methods to safeguard your house against burglary is with a home security system. Technology has contributed to the advancement of gadget that is better at offering security and monitoring a definite region or establishment that requires security. Alarms and sensors are part of security systems that are installed in homes as an effective and efficient approach to protect residential property. It is intended to find instances of burglary. Any of the different tools or techniques used in security and protection systems is intended to protect persons and property from a various forms of dangers, for instance fire, crime, accidents, espionage, sabotage, sedition, and attack.

The majority of buildings have closed-circuit television surveillance systems installed to watch over and document events inside the structure. However, it is possible for overlook burglary occurrences to be captured on camera [2]. Additionally, because an incident will only be discovered after it has already occurred or after reviewing the video records, this system kind is unable to provide real-time protection to prevent property destructions.

The reason burglaries occur when security systems are there is that the burglar is aware that the device is only recording events and not a real-time system. These offenders might therefore boost their game to avoid detection. The research report presents an increased level of security in light of this important finding in order to prevent property damage and even for personal protection.

COMMON SECURITY SYSTEM ELEMENT

Key security system components you need to be aware of [3]

- a) **Motion detectors:** Any home security system must include motion sensors as a necessary component. They can be used for a wide range of things, like turning on inside and outdoor lighting, turning on cameras, activating alarms, and more.
- b) **Indoor and outdoor cameras:** Another essential component of a security system is a camera. You may utilize cameras to capture certain sections of your house or yard, and some of them can also stream the live feed directly to your tablet or smartphone.
- c) **Glass break detectors:** practical sensors that can identify the occurrence of the sound made by glass shattering and sound an alarm. These alarm system are very vital because they can notify you if there is attempt to break into your home by smashing doors glass or windows.
- d) **Door and window sensors:** monitor the opening and closing of the door or window to which they are connected to. These gadgets employed two sensors: one on the frame and one on the door or window. It creates a closed circuit when the door is shut; when the door is opened, the circuit shorts out, setting off an SMS or burglar alarm.
- e) **Yard signs and window stickers:** The associated signage is one burglar alarm element that could be easily overlooked. Although you might not consider these to be particularly significant, having these signs and window decals can dissuade potential intruders from breaking into a house.
- f) **Smoke detectors:** A comprehensive home security system includes smoke detectors, which are installed in the majority of homes. Additionally, some smart smoke detectors shout alerts aloud so you can hear them and determine which room the smoke is originating from.
- g) **Carbon monoxide detectors:** Smoke detectors are more prevalent, but carbon monoxide (CO) detectors are equally critical because CO has no color, smell, or taste. There is no mechanism to detect the presence of this gas.

ALARM SENSORS LAYERS

Three levels of a basic alarm system: [4]

- A. **Perimeter Protection:** The paramount route of protection in spotting a possible attacker. Entrances, windows, outlets, and casements are frequently where alarm sensors on the perimeter are located. Such holes must be protected as a top priority because they are used in the great majority of burglaries. The following sensors are perimeter sensors:
 1. **Glass breakage sensors:** These monitor glass shattering
 2. **Magneto-balanced switch:** In order to identify when a door, window, gate, vent, skylight, and other openings have been made, balanced magnetic switches (BMSs) are frequently utilized.
- B. **Area protection:** Volumetric protection is another name for area protection. The interior areas of a home or business are safeguarded by the sensors utilized for this purpose. These tools offer coverage regardless of whether the perimeter is breached and are particularly helpful in identifying the "stay-behind" attackers. The following sensors are used for area protection:
 1. **Microwave motion sensors:** an intruder's movement inside the secured area is detected using high-frequency electromagnetic energy.
 2. **Passive Infra-red (PIR):** When a moving intruder causes a change in the thermal energy pattern that meets the passive infrared (PIR) motion sensor's alarm criteria, the change in energy triggers an alarm.
 3. **Dual-technology sensors:** Integrate two distinct technologies into a single device to reduce the creation of alarms brought on by sources other than invaders. The ideal way to do this is to combine two sensors, each of which has excellent reliability and doesn't react to typical false alarm triggers.

- C. **Spot Protection:** A technique for spotting suspicious activities in a specified area. It acts as the last line of defense in a standard alarm system. Spot protection is most frequently used to secure high-value items including safes, vaults, file cabinets, artwork, jewelry, and guns. There are numerous varieties available, including
1. **Capacitance Sensors:** Detecting alteration in capacitance (the storage of an electrical charge) between the metal object and the ground, capacitance sensors can identify an intruder who is nearing or touching the metal object.
 2. **Pressure mats:** When force is applied to any area of the mat's surface, pressure mats sound an alarm.
 3. **Pressure switches:** Switches that are mechanically triggered can be utilized as pressure switches. The switch can be topped with items that need to be protected. The switch activates when the object is moved, sounding an alert.

LITERATURE REVIEW

[5]. Presented a system that incorporates Bluetooth communication prototyping. Two laptop computers were linked via USB to an Ericsson ROK 101007 Bluetooth module to create a Bluetooth communication link. The laptop computers each had a Bluetooth stack installed on them. A serial link will be used to connect the motion detector to one of the computers (serial cable between the motion detector and laptop). Direct computer screen monitoring is possible for system status, connection, and detection.

[6]. the zonal based detection was the core idea. The warning light would turn on as a precaution if the burglar was discovered outside the home. A silent alarm will be dispatched as soon as intruders reach the compound, which is a medium-risk zone, alerting the guard house or a nearby neighbor to the condition. The loud alarm will finally blare to startle the burglars once they enter the residence. Two Bluetooth modules, one from Spark-fun called Bluesmirf Gold and the other from Ezurio called Bluetooth Inteligent Serial Module II (BISM II), were needed for the communication security unit. A Bluetooth dongle from Ezurio was employed to connect to the personal computer (PC) through Bluetooth connectivity.

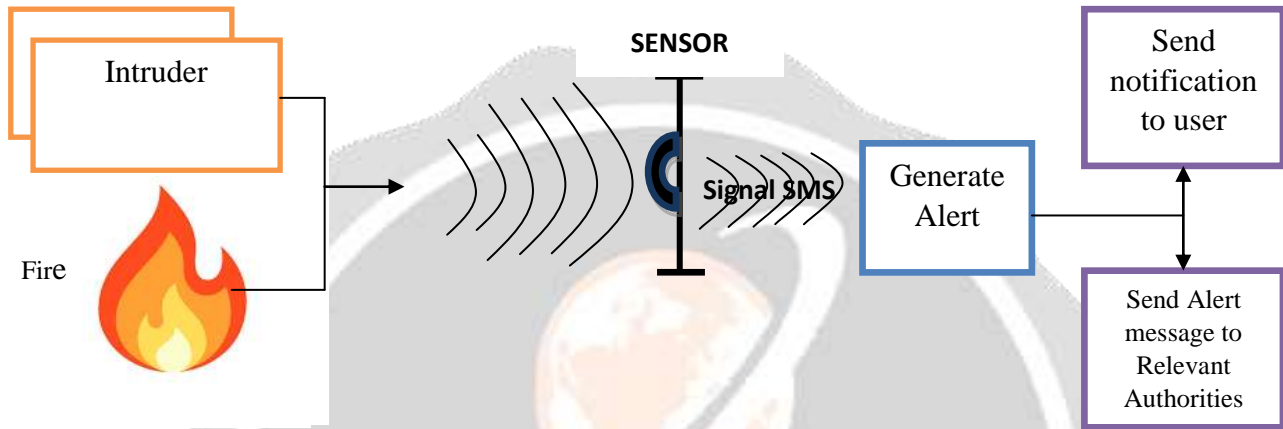
A circuit that is connected to a cell phone was designed and constructed [7]. The circuit links a serial port found in many cell phones. Its purpose is to give an input or output port that may be remote controlled using another mobile phone. SMS can be used as a tool for manipulation to control anything that has been set up for control. The circuit automatically detects a pre-defined text message as a command and switches output when it is received by a mobile device, such as "activate burglar alarm" or "start backup pump".

The modeled the movement of smoke from the fire to the detector using the Fire Dynamics Simulator model (a LES-based CFD model). For the purpose of calculating the transport of fire and smoke, the FDS code [8] uses a condensed low Mach number equation. The acoustic waves have been filtered in this method, but the movements are still allowed to be compressible. Therefore, to significantly cut down on computation times, the time step might be increased. For simulating fires and smoke, these condensed compressible flow equations are more computationally effective. To deal with turbulence, a Large Eddy Simulation (LES) method has been adopted. A set of filtering equations regulating the three-dimensional, time-dependent motions are used by LES to solve the big eddy motions. This technique was utilized in their research because it would use motion sensors to detect the presence of people or intruders (9).

When human skin is identified, the proximity sensor algorithm's design is somewhat simplified. Human skin may be penetrated by infrared light. With the best optical designs, proximity sensing performance with other non-human sensing objects, the peak is shifted to a closer distance and the Analogue Digital Converter (ADC) count does not drop at zero distance. Due to the structure of this response, a straightforward threshold system can be used to determine whether a person is nearby (for example, while answering a cell phone call). To disregard any fluctuations in background noise, the low threshold must be adequate set high. The peak output ADC count may change, thus the high threshold needs to be low enough to handle it. The distance between them must also be sufficient to accommodate any changes in the environment. [10].

METHODOLOGY ADOPTED

The improved home security system is a sensor-type alarm that uses motion and heat sensors as its sensory device. It will be set up in a concealed area of the structure. The user's alarm system will be a Smart phone or tablet. The devices communicate with each other via SMS Technology, which sends a signal from the sensory device to the user's Smart phone, which then receives it and sends a text message to the authorities. When the signal is received, the mobile phone or the alarming device will ignite a warning alarm and display a pop-up notice. The system's status can be checked as well as activated or deactivated by the user. Any action in the area where the sensor is installed can be detected by the improved home security system.



flow diagram for home security Intrusion & Fire Detection System

The sensor transmits a signal to the Smart phone device where the user can read the notification as soon as the intruder and fire are detected. If an activity is found, the smartphone will ring and the mobile application will show up.

The method of the improved home security system for mobile application is shown in the flowchart, which is depicted in figure 2 below. The interface that is shown when the software is running ; if the system receives an SMS signal, it generates an notification sound; if the signal is from an invader, it notify the user and automatically sends an alert message to the appropriate authority. If there is a fire, it alerts the appropriate authority's phone line that there was a fire and sends an alert message automatically to the user.

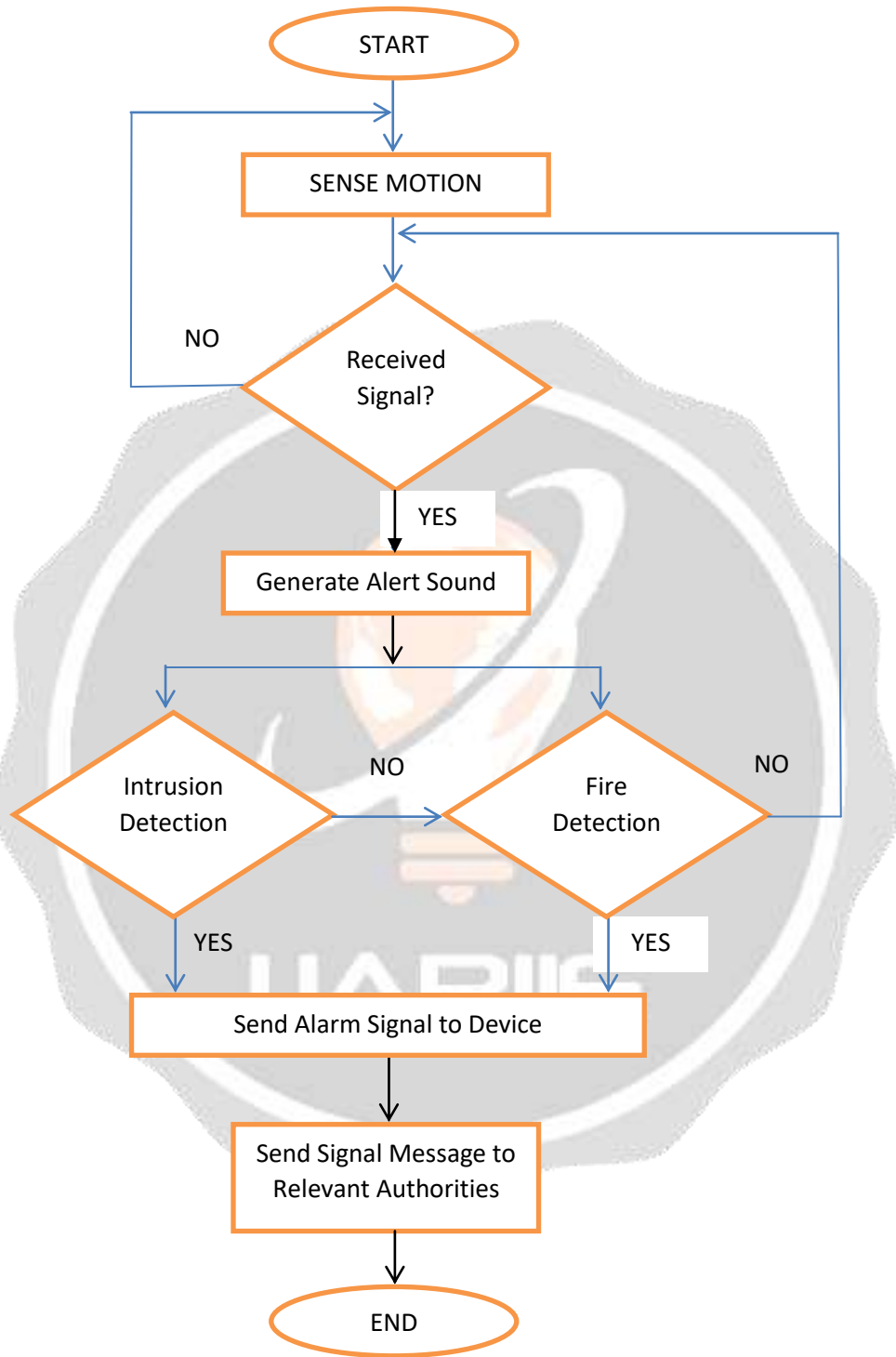


Figure 2: Flowchart of the enhanced Intrusion and Fire Detection System for Home Security using Mobile Application

This paper focuses on developing a wireless notification security system using widely accessible SMS technology in an effort to advance the security of the establishments given the status of security technologies today.

CONCLUSION

The mobile application for the enhanced home security system is user-friendly and simple to use. Through an extra mobile application feature, it helps to protect both properties and against crime by promptly alerting the user. It is simple to visit the property from anywhere the homeowner may be and find out if there have been any burglary or fire incidents. With this, the user may take the necessary steps before anything on the home, business, or property might happen, and it also notifies the appropriate authorities if fire is discovered or intruder activity occurs. The system for handling fire detection and intrusion detection in home security was presented in the article as being thorough, effective, and appropriately organized.

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