Arduino and Android Interface based Smart Security System

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Abstract—

In this new technical world the interactive applications replace the traditional security system. This paper deals with design and implementation of smart surveillance monitoring security system using android technology. The two main approaches are providing smart security and creating awareness to the people. However, this paper looks into the development of an ANDROID application with new ARDUINO processor which interprets the message a mobile device receives on possible intrusion and subsequently a reply SMS which triggers an alarm/buzzer in the remote house making others aware of the possible intrusion.

Index Terms—

Android, Arduino, Mems, Pir, Gsm.

I. INTRODUCTION

The security of one belonging when the Home or Office is vacant is always a matter of concern as with the increasing number of incident of Controlling home appliances remotely with mobile applications have started becoming quite popular due to the exponential rise in use of mobile devices. Mobile handsets today are essentially handheld computers with integrated mobile radio communication capabilities. With vast and tremendous increases usage of GSM and a networked services relate us to communication to incorporate many other custom applications, This paper discusses an approach where an authorized android mobile user receives an SMS when a unauthorized tries to enter his house or office in a remote location. The minimum requirement at the user end is that the mobile device should have an ANDROID OS. ANDROID is a java based OS. It's lightweight and having full featured. Here A hardware embedded circuit with a sensor and a GSM modem embedded is installed and connected to the door of the house. When the intruder tries to open or break the door, the switch triggers an interrupt and subsequently sends a signal into the microcontroller which subsequently triggers the GSM modem to transmit a warning SMS into already registered number in the modem. The SMS on the users' end is interpreted by the ANDROID Application and if it finds that the SMS is from the designated number; the application immediately informs the person with a frequent pop-up menu. If the user positive acknowledge the pop-up in 1 minute, an acknowledgement is send back to the remote GSM modem. The modem outputs an interrupt to the microcontroller and the microcontroller subsequently triggers an alarm.

II. EXISTING SYSTEM

There are lot many Home security systems are available in the market. Different approach has been proposed. However, Smart security system using ANDROID is still ongoing research project field. Many multinational companies are trying to join home control arena with ANDROID application. Earlier 8051 has been extensively used with combination of IR sensors. Still developments are ongoing in this area.

III. PROPOSED SYSTEM

In this proposed smart security system, we use ANDROID technology with the combination with the latest ARDUINO microprocessor which is very new as Compared with the ARM or 8085/8051. The intruder is intimated using android technology. Here PIR sensor detects the motion .MEMS sensor and PIR sensor with combination to the controller immediately sends that intruder detection information to the corresponding owner mobile. This design integrates the device to be controlled, the microcontroller, and GSM Module so that it can be used for a wide range of applications.

The proposed M2M design in this paper uses a PC as the terminal user instead of microcontroller. In such a design, GSM dialup and communication protocol is embedded in the PC. The M2M microcontroller interacts with the M2M engine, embedded with the SIM card. The information that will be sent to the network has to be taken to a microcontroller to make the interface between the machine and M2M engine. They had used different modules such as check and read message module ,which check any received message from the M2M module using AT commands, a decode module which decodes the text message and excludes all other details such as date, time and sender's name.
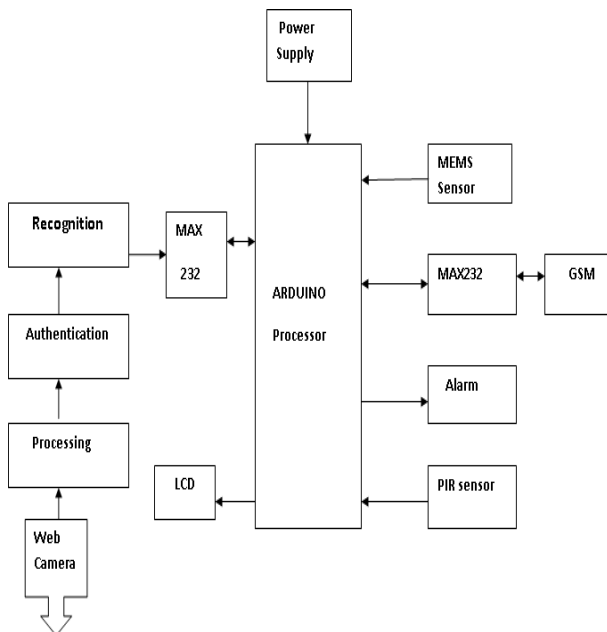
IV. BLOCK DIAGRAM

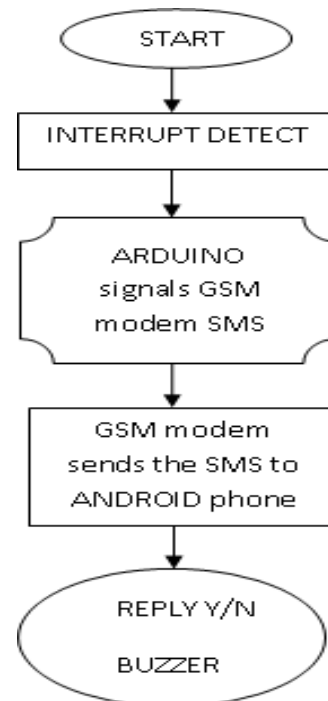Fig 1. System Architecture

V. FLOWCHART

Fig 2. Flow Chart

In proposed system, we can design a new home security system. The intruder detection is intimated using android technology. When a person wants to go outside, at that time if he wants to give the security to the home. He can just switch ON the particular android application to provide the security and here web camera is used to capture the intruder image. MEMS sensor is used to find whether the intruder try to open the door lock or not. If the intruder tries to break the door means, the PIR sensor detect that motion. The controller gets the intruder information using MATLAB process. MEMS sensors and PIR sensor, the controller immediately send that intruder detection information to the corresponding house owner mobile. The owner's mobile automatically reply to initiate the alert information as a buzzer to the other people nearer to that home. The LCD is used to display the current process of the system.

VI. HARDWARE IMPLEMENTATION

Here the circuit is designed in the simulation software. The methods designed in Flowcharts were properly implemented in this phase. The SENSOR monitors for any kind of INTERRUPT and sends signals the ARDUINO The microcontroller in turn sends a digital signal (since microcontroller understands only TTL logic) to the GSM modem which is received by the MAX232 IC incorporated inside the GSM modem and converts it into an analog signal The GSM modem then sends a SMS to

the user ANDROID mobile phones signaling that an intrusion has occurred. The SMS is then processed upon by the ANDROID application. When a proper reply is received at the modem again; depending upon the SMS the GSM modem will send a specific signal whether to play or do not play the buzzer.

A. Arduino Microcontroller

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time.The Arduino project was started in Italy to develop low cost hardware for interaction design.
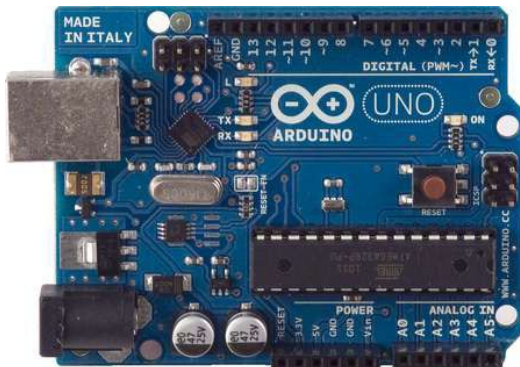
Fig 3. Arduino microcontroller

B. GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

Fig 4. GSM Modem

C. MEMS Accelerometer

An accelerometer is a device for measuring acceleration and gravity induced reaction forces. Single- and multi-axis models are available to detect magnitude and direction of the acceleration as a vector quantity. Accelerometers can be used to sense inclination, vibration, and shock. They are increasingly present in portable electronic devices.

Modern accelerometers are often small micro electro-mechanical systems (MEMS), and are indeed the simplest MEMS devices possible, consisting of little more than a cantilever beam with a proof mass (also known as seismic mass). Mechanically the accelerometer behaves as a mass-damper-spring system; the damping results from the residual gas sealed in the device. As long as the Q-factor is not too low, damping does not result in a lower sensitivity.

Under the influence of gravity or acceleration the proof mass deflects from its neutral position. This deflection is measured in an analog or digital manner. Most commonly the capacitance between a set of fixed beams and a set of beams attached to the proof mass is measured. This method is simple and reliable; it also does not require additional process steps making it inexpensive. Integrating piezo resistors in the springs to detect spring deformation, and thus deflection, is a good alternative, although a few more process is needed. For very high sensitivities quantum tunneling is also used; this requires specific fabrication steps making it more expensive. Optical measurement has been demonstrated on laboratory scale.

Another, far less common, type of MEMS-based accelerometer contains a small heater at the bottom of a very small dome, which heats the air inside the dome to cause it to rise. A thermocouple on the dome determines where the heated air reaches the dome and the deflection off the center is a measure of the acceleration applied to the sensor.

Most micromechanical accelerometers operate in-plane, that is, they are designed to be sensitive

only to a direction in the plane of the die. By integrating two devices perpendicularly on a single die a two-axis accelerometer can be made. By adding an additional out-of-plane device three axes can be measured. Such a combination always has a much lower misalignment error than three discrete models combined after packaging.

Micromechanical accelerometers are available in a wide variety of measuring ranges, reaching up to thousands of g's. The designer must make a compromise between sensitivity and the maximal acceleration that can be measured.

D. PIR sensors

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are basically made of a pyroelectric sensor which you can see below as the round metal can with a rectangular crystal in the center, which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.
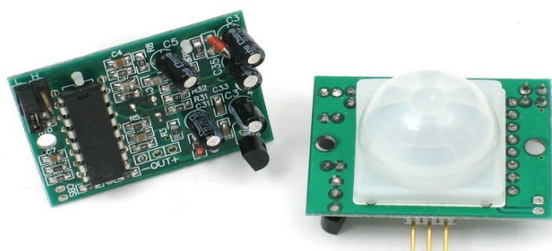

Fig 5. PIR Sensor

VII. CONCLUSION

The APK (ANDROID Application Package File) file have been deployed to ANDROID enabled mobile devices and tested. The hardware circuit meant to detect intrusion is installed. On interrupt intrusion, the GSM modem successfully sends a message to the ANDROID application installed in the mobile device. If the user fails to response in the defined time period, the application successfully sends a default message to the remote device, subsequently triggering the buzzer. The application discussed here is sure to benefit every people who always have a doubt of their belongings being secure in the house in their absence. Most of the mobile devices that are manufactured nowadays in the market are ANDROID OS based. Taking this into interest the application has been developed in ANDROID and made user friendly, thereby making the application highly robust across different mobile devices and variety of users.

Certain features like triggering an electronic lock remotely rather than simply triggering the buzzer might be more useful to the users and will surely be taken care of in the near up gradation of the complete application. Also the system may be turned into a complete Home Automation System by implementing different sensors e.g. Motion Sensors, Gas Sensors, Temperature Sensors, etc. in the near future.

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