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Security System Based on Knock-Pattern Using Arduino and GSM Communication

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Abstract:

With the constant progress in the technological world, concerns for safety also increase day by day. Protection like keys can be replicated quite easily. So, here is a smart security system with the use of 'Arduino' microcontroller, Piezo Electric and GSM Module. Here, the security system is based on a "secret knocking pattern" which can be installed to a 'safe' or any other similar object which needs protection. The lock unlocks only when a certain secret knocking pattern is implemented and an SMS alert is sent if anyone tries to sneak into contents by knocking differently. This concept eliminates the fear of replication as there is no physical Unlocking Object to start with. Thus, the smart 'Knock Based Security System' can be an added protection in our everyday lives. Arduino Uno board which act as a microcontroller unit. The Piezo sensor takes the knocking input and then passes it to the Arduino board where the input pattern is compared with the original Secret pattern. In case of wring pattern, the GSM sends an alert to the given Phone Number.

Keywords — **Piezo sensor, Arduino Uno, GSM, Hall-effect proximity sensor**

I. INTRODUCTION

The World has advanced greatly over the years and it has changed the way we live, the way we communicate, the way we learn and the way we change. One of those great advancements is advancement in Technology.

From invention of items like knives out of rocks to items like 3D printer to a super computer, Technology has come a long way. This advancement in Technology has been exceptional in the 20th and 21st Centuries. But with the advantages and benefits, also came the disadvantages and setbacks. One of examples of this advancement can be taken as the invention of the IPhone. IPhone was a major upgrade from the conventional type of using a phone because it was not only able to call and text but also was able to play music, videos, and download apps. Though these were the advantages, there were many disadvantages like battery drain and the decrease of face to face communication due to addiction to the smartphone. With such advancements in technology, there's always a need for security and privacy. One of the ways of securing something is a combination of a 'lock and key'. Modern locks and the locking system are far more complex and often use a dotted mechanism on the key which provide a greater security. But the disadvantage is that it's the same 'lock and key' mechanism, meaning, the key can always be replicated with some effort. One of the solutions is to completely discard the 'lock and key' mechanism itself. This project aims to do the same by establishing strong security basing on a 'Secret knocking pattern', thus the name, **"Knock Based Security System"**.

This system is comprised of devices like Arduino, GSM Module , Servo Motor etc. and uses a 'Secret Knocking Pattern' which is known only to the owner of that particular safe, suitcase or any other Property or object that the device is installed on. The increase in security in implementing this system comes into the picture in several ways

- The knocking pattern has to be implemented only at a certain place for the lock to open and that place is known only to the owner.
- The only way to change the secret pattern is by unlocking it first through the secret knock.
- This system completely removes the fear of replication as there is no key involved to be

replicated.

Our design is an attempt towards the cost effective solution for safety. This can also be integrated with technology like CCTV which can increase security. The piezo electric sensor is used to take analog inputs and a push button is used to allow the input to be taken. Arduino Uno is the processing and controlling unit of this system which receives and processes and controls the data from all the sensors. The GSM unit acts as an interface between Arduino and user's mobile and is responsible for communication between them. Arduino will trigger an alarm and send an alert message to the mobile station in case of any suspicious activity like a wrong pattern input. This system can be installed on a suitcase, rack or safe like commodity where valuables are kept. The sensor detects the knocking pattern and generates pulses which are read by the Arduino. According to the pattern received by microcontroller, an alarm is triggered and an SMS is established to mobile station through the GSM module and thus warns about the suspicious activity at home to owner. The Piezo sensor can be attached at any place which can be kept as secret.

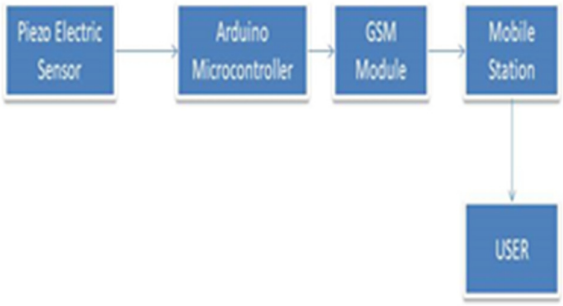
II. LITURATURE SURVEY

In [1] a fully automated feature rich digital home system is designed and developed. Digital Home System is combination of automated services i.e. Electronic Device Controller, IR Security System, Web Desktop, remote Video Surveillance System and Virtual Mobile. In [2] proposes construction of a microcontroller based automated Home Security System. The door lock is password protected with an LED based resistive screen input panel which operates by detecting difference in light intensity captured by the photo diode which is emitted by surrounding red LEDs and reflected by the finger. [3] Minal Nikose, Pratibha Mishra, Avinash Agrawal, "A Review On Industrial Automation By Zigbee Based Wireless Remote Controller", Proper use of wireless sensor networks (WSNs) can lower the rate of catastrophic failures, and increase the efficiency and productivity of industrial operations. Diversification of remote control mode is the inevitable trend of development of smart appliances. This

paper proposes a review on remote control system of smart appliances based on Zigbee wireless sensor network. Status of the home appliances can be queried and controlled through the remote controller. The proposed work presents the design and implementation of a novel wireless sensor network based home security system with a modular self-reconfigurable remote controller. [4] Jayashri Bangali, 2Arvind Shaligram," Energy efficient Smart home based on Wireless Sensor Network using LabVIEW", Smart home is a house that uses technology to monitor the environment with the help of various sensors, control the electrical appliances and communicate the outer world. Now-a-days the demand for home automation systems in homes and offices are invariably increasing. In this paper we present the design and implementation of a smart home based on LabVIEW using wireless sensor network system. The system can monitor the temperature, light, fire & burglar alarm of the house and have infrared sensor to guarantees the family security. The monitored data is automatically stored into an excel file. The system can be connected to internet to monitor the security of home from anywhere in the world. [5] Wuhan, Hubei," A Remote Home Security System Based on Wireless Sensor Network and GSM Technology", in this paper, a low-power consumption remote home security alarm system developed by applying WSN and GSM technology is presented. It can detect the theft and send alarm message remotely. The system software has the ability of collecting, wireless receiving and sending data, and can send a piece of alarm short message to the user's mobile phone when some dangerous condition has been detected. [6]N. Bharath Kumar, "Anti-Theft ATM Machine Using Vibration Detection Sensor", this paper provides security system for ATM machines. Now a days there is no particular security system for ATM machines. The only security system provided at the ATM centers is ATM card detector near the doors. If the inserted card is authorized then the door will open automatically. [7]Instrumentation and Measurement Technology Conference (I2MTC), 2012 IEEE International," Sensor based

home automation and security system", presents the design and implementation details of this new home control and security system based on field programmable gate array (FPGA) The user here can interact directly with the system through a web-based interface over the Internet, while home appliances like air conditioners, lights, door locks and gates are remotely controlled through a user-friendly web page [8] Rupinder Singh Brar, "ARDUINO Based industrial security system using piezo electric sensor." Security is prime concern in our day-to-day life. Everyone wants to be as much as secure as to be possible. An access control systems forms a vital link in a security chain. The Arduino controller based digital lock presented here is an access control system that allows only authorized persons to access a restricted area. This system is best suitable for corporate offices, ATMs and home security.

III. BLOCK DIAGRAM



Block diagram of proposed System

The block diagram of the system is shown in figure 1. As shown above, the microcontroller unit is interfaced between input sensor and GSM communication. The data from the sensors is continually processed by the microcontroller and an alert is sent to the mobile station via GSM if something wrong is sensed.

- WORKING

The system will remain in deactivated mode initially. It is activated using a switch or a push button (here).

A. PIEZO ELECTRIC SENSORS-

TA piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix Piezo- is Greek for 'press' or 'squeeze'.

B. ARDUINO –

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

A. GSM MODULE-

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a

dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

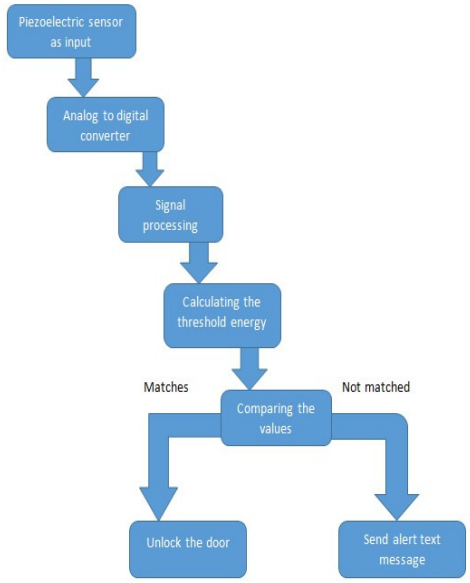


Figure 2. Working Algorithm

Figure 2 shows a working model flow of the device. An alert is sent once it is detected that there is a wrong pattern input.

CONCLUSION

In this generation of advanced technology, theft and crime has taken the aid of technology itself in achieving its results many times. To avoid such circumstances, sometimes even small things can lead to a great change. Thus, implementation of smart devices in Security Control like the Knock Based Security System can prove to be very valuable to the person using it and also to the valuables themselves. In this paper, the issue of safety is being addressed through easily and affordable technology like piezo sensor, GSM module, Push button, and Arduino microcontroller. This can also be improved by interfacing with various technologies like finger print reader, voice detection etc., thus making it much more secure while not being too costly and out of reach in terms of availability.

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