# Security System using Arduino

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**Abstract**

*Nowadays there is a need to build an affordable and effective intrusion detection system. We are approaching towards making our house a smart house in this digital era. Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet. IoT is the development production of the computer science and communication technology. In IoT, each device behaves as a small part of an internet node and each node communicates and interacts[1]. When it comes to our house, this concept can be aptly incorporated to make it smarter, safer and automated. Nowadays the possibilities of intrusion are increasing day by day. Lot of security companies are available towards protecting house from getting vandalized or so. But still there is no much guarantee that the housewill be safe. This paperpresents a design and prototype implementation of new security system using arduino. It utilizes an ultrasonic sensor to detect any intrusion. In case of detection it alerts the people by lighting up the LEDs and it starts to make sound via buzzer.Whenever any intrusion occurs, we can fetch the distance between sensor and object using ultrasonic sensor.*

**Keywords** - *Internet of things, Arduino, Intrusion detection, Ultrasonic sensor, LED's, Buzzer.*

## I.    INTRODUCTION

IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system. IoT systems have applications across industries because of their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful technologies. Security system has become an integral part in our life now. With security system we feel more secure and comfortable.IoT can be applied in smart cities in order to enable various applications that can assist the citizens[2-3]. People now live in the era of information technology. There are numerous ways in our dailylivesto get to the Internet and make ourlives easier and more agreeable by using technologies such ascomputers, Smartphones, smart TVs, tablets, and some smart cars. New devices can run any programs, in a more effective manner way for doing different tasks such as turning on or turning off the device, making alerts using the built-in or external sensors etc. The Security system can be placed at any place and the installation is pretty simple. In this paper, we have designed an Arduino based Security System using simple hardware. Surveillance plays a vital role in enablingour safety. The   sensors play a very important role in this security system. The most common types of sensors are Passive Infrared Sensor (PIR), Ultrasonic sensor, Infrared Proximity sensor and noise detector[1].  The wireless system gives a proficient, elegant and robust solution for the issue of remote home access, security, and surveillance with human detection.

### A.  Ultrasonic sensor

The ultrasonic sensor sends out a high-frequency sound pulse and then calculates that how long it takes for the echo of the sound to reflect back. The sensor has two opening one transmits ultrasonic waves (like a tiny speaker) which is also called as trig pin, the other receives reflected ultrasonic waves (like a tiny microphone) which is also called as echo pin. The speed of sound is approximately 341 meters (1100 feet) per second in air. The ultrasonic sensor uses this information along with the time difference between sending and receiving the sound pulse to determine the distance to an object. It uses the following equation:

Distance = (Time x speed of sound) / 2

Time $\rightarrow$ The time taken between an ultrasonic wave when it is transmitted and received. We divide this number by 2 because the sound sensor wave has to travel to the object and back to the sensor.

Ultrasonic sensors are great fit for many applications, but it is always good to understand that every product has advantages and limitations on what it can do [4][5].

### B.  Advantages of Ultrasonic sensor

The Ultrasonic sensor will not get affected by colour  or  transparency  of  objects. Ultrasonicsensor   reflects   thesound   of objects,hencethe colour or transparency has no effect on the sensor'sreading. Ultrasonic sensors can

be used in dark environment andit is not expensive. They come fully calibrated and ready to use. We strive to go to a low cost, high quality product suited for specific needs. This sensor is not necessarilyaffected by dust, dirt, or high moisture. This sensor has great accuracy than any other methods in measuring thickness and distance to a parallel surface. Their high frequency, sensitivity, and penetrating power makes it easy to detect external or deep objects. Ultrasonic sensors are easy to use and not dangerous during operations to nearby objects, people or equipment. This sensor easily interfaces with microcontrollers or any type of controller [6].

### C. Limitations of Ultrasonic sensor

Ultrasonic sensorscannot work in vacuum, because they operate using sound. They are completely non-functional in vacuum as there is no air for the sound to travel through. This sensor has not been designed for underwater use and hence these sensors have not been properly tested in this environment.The sensing accuracy of this sensor isaffected by soft materials. Objects covered in a very soft fabric absorbs more sound waves making it hard for the sensor to see the target. Sensing accuracy is also affected by changes in temperature of 5-10 degrees or more, although this is true we can overcomethis problem by using variety of temperature compensated sensors. This sensor has limited detection range of 3 cm to 3 m [6].

## II. EXISTING SYSTEM

Nowadays security plays a very important role in our daily lives. Security systems are used in residential, commercial and military domains for protection against theft or property damage, as well as personal protection against intruders. People face problems like robbery, attacks and deception. People face these problems due to the absence of security systems in their houses, office and buildings. As technology is growing day by day many companies have come up with the solution for these problems to provide security with the help of technology. We have some existing security system but these are not as efficient as our proposed system. Obstacle detection is one of the challenging problems in the navigation systems. There are obstacles made of different materials, in which the performance of the distance measurement sensor varies [9]. There are some sensors which can be used to detect the obstacles and find the distance of object from the sensor. For instance infrared proximity sensor can also be used for object detection. These sensors work on the principle of reflected light waves which are reflected from objects or sent from an infrared remote or beacon. Infrared sensors are also used to measure distance or proximity. The reflected light is detected and then an estimate of distance is calculated between sensor and object. But infrared

sensors cannot work in dark environments. There are a lot of limitations of infrared sensors, like the inability to use them in sunlight due to interference. It can make outdoor applications or dark indoor applications very difficult. These drawbacks of infrared proximity sensors can be overcome by using ultrasonic sensor. Ultrasonic sensors can work in dark environments. Since ultrasonic sensors work using sound waves, detecting obstacles is not affected by many factors. Ultrasonic sensors are more reliable than IR sensors [5]. Some other existing systems like security alarm and security system use PIR sensor[11][10]. But these systems are of high cost compared to our proposed system. Proposed system consumes less power, is of low cost, easily operable and easy to install in comparison to existing intrusion detection system. The proposed system is also easy to handle and we can place it easily near windows, doors and gates.

## III. PROPOSED SYSTEM

Our primary objective is to prevent any event that may pose a security or safety concern from implementation in the home networks. Security is a main concern in our day-today life. Everyone wants to be more secure as possible. Knowing thatour home is protected provides us a peace of mind both when we are away and when we are at home. Extra security systems are important even if you have better public safety agencies (police, fire etc.) in your area. So we have implemented a system that does almost everything in order to secure a house , company or any other structure.

### A. Advantages

The security system is more secure, is reliable, enabling real-time awareness and alerts from your home, and combating many of the vulnerabilities you will find on other types of system. The system is easier to install with faster support. It is easy to replace an existing system or add a new functionality. The system is flexible and versatile. It is easy to implement and expand the system. It is the foundation of a true smart home. It is cost effective.

### B. Disadvantages

There is limited distance under which sensor can detect the object. The ultrasonic sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm only.The thief can also jam the signal produced by the sensor that can take the sensors anywhere from a few minutes to three hours to re-establish communication with the object[8].

## IV. WORKING

Coming to the working of thesystem, the system only works with the help of electricity. When the ultrasonic sensor is active, the sensor sends ultrasonic waves. When any intrusion occurs it will reflect the ultrasonic wave back to the echo pin and then calculates the distance between the intruder and sensor. When the sensor detects any object it starts to make sound and the LED lights start to blink.
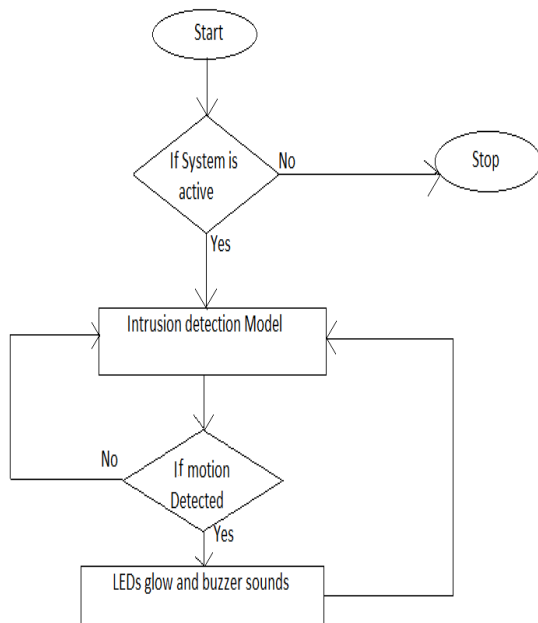


The flow diagram abovedepictsthe working ofthe intrusion detection model which helps us to detect the intrusion. If there is any intrusion then it alerts the user by glowing LEDs and by making noise or sound with the help of buzzer. If there is no intrusion it continues the same process.

## V. FUTURE WORK

In future we can implement this system by using Arducam MT9D111 camera module [7]. This camera module is used for capturing images when any movement is detected. We can enhance and automate the security of our industries, cities, homes and towns by using this methodology. We can also make use of smart phones in this security system so that the images captured can be sent to the same in the form of notifications.

## VI. CONCLUSION

We have designed embeddedhuman detection with smart security system. Proposed system presents the design and implementation of an intrusion detection system using ultrasonic sensor. The ultrasonic sensor is used for detecting the movement of people, animals or any object by sending the sound wave pulse respectively. Once the sensor encounters any intrusion or motion it alerts the people by glowing LEDs and starts to make sound via buzzer. Arduino has various good features and low cost embedded hardware platform. The system consumes less power, is of low cost, easily operable and easy to install in comparison to existing intrusion detection system. The system is also easy to handle and we can place it easily near windows, doors and gates. To enhance and automate the security of our industries, cities, hometown and the earth this methodology can be used.

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