

# IOT Based Border Security System

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**Abstract-** Border security is developed to secure the area where no one permissible to enter, also where need to detect any motion as be done. Up till now CCTV's cameras are installed everywhere, which continuously records the situation, so there is problem of memory wastage and also the CCTV system does not provide alerts of burglary at specific time. To overcome this problem the new system is introduce. In this system cameras and sensor are most important component. Ultrasonic Sensor sense any activity at that time camera capture the images. This image is compared with the database in which authorized person's images is stored. If match is not found then system notify to the user to turn on the Wi-Fi<sup>[3]</sup> then system get mac address of user mobile phone then compared with the database if match found, permit the user otherwise mark as unauthorized user and buzz the alarm and send sms to authorized person and nearest police station.

**Keywords-** technology, CCTV, etc.

## I. INTRODUCTION

The main purpose of the System is to enhance the border security electronically with automation and with that to reduce the work load and responsibility of the soldiers that continuously take a look on border 24x7. This project will not fully remove the responsibility of soldiers but shares the maximum responsibility and will reduce human efforts on the border<sup>[1]</sup>. The border length is very long hence soldiers are patrolling but soldiers are not present at every part of the border due to the long length. To overcome this, we are going to implement this system. It has a wide range of intruder detection system that can be deployed at critical locations on land, to enable quick, accurate and secure localization of a threat. These system offers a complete robot action which design to keep the enemy out of reach from line of control. That is what it saves the most worthy

Human life. The proposed system is mainly design to provide remote accessibility using wireless technology for land soldiers on battle field. The proposed idea has a simple design and has a very high range; it covers a very large border area securing the border area from illegal entries, smuggling and illegal movement of weapon without much involvement of security forces near border. If obstacle enters the border it automatically detects the obstacle give warnings and send the

record of activity to control room. Also it eliminates the enemy in more efficient and better way. Border security robot utilizes ultrasonic sensor for human detection, and a wireless camera for monitoring the scenario continuously at the remote station.

## II. RELATED WORK

Surveillance is very useful to governments and law enforcement to maintain social control, recognize and monitor threats and prevent/investigate criminal activity. The final step of an intelligent visual surveillance system is to analyze the content of the video and to identify important events in a scene. The main goal is to detect the object efficiently using background subtraction techniques; aims to reduce the cost and to increase efficiency in the security systems<sup>[1]</sup>. Video encoder can improve the efficiency of compression algorithm and reduce the transmission rate<sup>[2]</sup>. This method adopts pixel-based difference to find the moving object<sup>[4]</sup>. The user can define the threshold according to the characteristics of the received images and objects that must be followed to have<sup>[5]</sup>. It is clear that by reducing this threshold, obtained image will have more details and also more noises<sup>[5]</sup>.

## IMPLEMENTATION

The system is implemented such that it will record only for unwanted situation around the border or fence. For this sensors and cameras are being used which are place at every side of fence<sup>[5]</sup>. In this system Ultrasonic sensor is going to be used to sense movement of people, animal, or other object. They are commonly used in burglar alarms and automatically activated lighting system<sup>[3]</sup>. The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, the other receives them, 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<sup>[8]</sup>. It uses the following mathematical equation:

Distance = Time x Speed of Sound divided by 2

Time = the time between when an ultrasonic wave is transmitted and when it is received

You divide this number by 2 because the sound wave has to travel to the object and back point The sensor converts the resulting change into the output voltage and this triggers the detection<sup>[8]</sup>. When this sensor sense the sound pulse it will inform to camera, camera start capturing the images the range of camera is about 4mtrs and capture image is then check by image processing algorithm if the image match with the database the it will allow to enter otherwise MAC address verification is perform if mac address is verified correctly then it will permit to enter. If image or MAC does not match with database, it will buzz an alarm and send sms to police station and authorized person.

**Algorithm:**

- Step 1: Start
- Step 2: Ultrasonic sensor start sensing and sense the person.
- Step 3: Webcam start capture the image.
- Step 4: Captured Image is compared with the database in which authorized person image is stored by using below algorithm
- Step 5: If image is found then person is permitted to enter in system
- Step 6: Otherwise person have to open Wi-Fi and connect it then Mac identification is done.
- Step 7: If Mac identification done successfully then system allows entering the person. Otherwise system buzzes the alarm and sends message to the authorized person and nearest police station.
- Step 8: End.

**Image recognition Algorithm** <sup>[10]</sup>:

- Given an unknown face image  $\Gamma$  (centered and of the same size like the training faces) follow these steps:

Step 1: normalize  $\Gamma$ :  $\Phi = \Gamma - \Psi$

Step 2: project on the eigenspace

$$\hat{\Phi} = \sum_{i=1}^K w_i u_i \quad (w_i = u_i^T \Phi)$$

Step 3: represent  $\Phi$  as:  $\Omega = \begin{bmatrix} w_1 \\ w_2 \\ \dots \\ w_K \end{bmatrix}$

Step 4: find  $e_r = \min_l \|\Omega - \Omega^l\|$

Step 5: if  $e_r < T_r$ , then  $\Gamma$  is recognized as face  $l$  from the training set.

- The distance  $e_r$  is called distance within the face space (difs)

Comment: we can use the common Euclidean distance to compute  $e_r$ , however, it has been reported that the *Mahalanobis distance* performs better:

$$\|\Omega - \Omega^k\| = \sum_{i=1}^K \frac{1}{\lambda_i} (w_i - w_i^k)^2$$

**SYSTEM ARCHITECTURE**

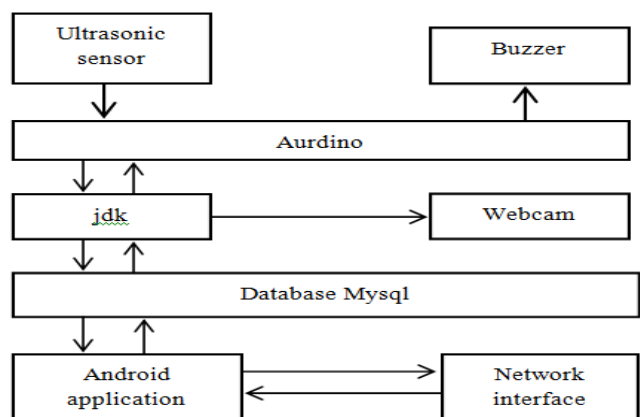


Fig1. Architecture diagram

**Ultrasonic sensor:** ultrasonic sensor is used to detect the person by their sound pulse. It can sense all material types. It is not affected by any type atmosphere can work in adverse condition also<sup>[2]</sup>.it has sensing distance compare to any other sensor and provide good reading on object with hard surfaces.

**Arduino:** Arduino board is used for interfacing between the computer system and sensors.

**Jdk:** this jdk is used for connectivity between java code and MySQL database.

**Database:** MySQL database is to store the data of authorized user

**Webcam:** webcam is used to capture the images and comparison is done between computer images and capture images.

Android application: this application is developed for MAC address verification.

Network interface: it used to interface between the mobile application and network around the area.

Buzzer: Buzzer will give alert to the system.

#### Advantages

- It provides a new monitoring control capability for monitoring the borders using this we can easily identify a stranger.
- It required low power system and low cost to allow distribute a small fraction of the cost of sensor and actuator system.
- It uses less memory to store data.
- It gives awareness will provide personal help monitoring and enhance system security efficiency.
- It avoids hell lot of wiring.
- It can accommodate new devices at any time.
- It can be accessed through a centralized monitor.

#### disadvantages

- Comparatively low speed of communication
- Get distracted by various element like Bluetooth
- Still costly at large.

#### Application

- Home automation.
- Military.
- Power station.
- Airline and airport.
- Border automation.
- Identify management.

### III. CONCLUSION

A variety of motion detection algorithms for video surveillance systems are developed. But most of the systems do not absolutely detect the moving object because it causes some darkness and it requires large memory to store the video. We are developing a system that will be helpful for detecting the moving object without present of shadow. By using border security system fence will be more secured as it will send alerts regarding burglary happening. Moreover it will save memory and memory wastage would be avoided.

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