

# BORDER SURVEILLANCE SYSTEM USING DEEP LEARNING

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**ABSTRACT:** Border surveillance is the most important task in the field of national defense and security. To maintain peace and to ensure safety of a country's people, the borders need to be kept under 24/7 monitoring. Especially, under current circumstances, when activities like terrorist infiltrations and illegal movement of both living as well as non-living beings have become common, it becomes of utmost importance to strictly protect the border areas against such activities

**Keywords-** Border surveillance, monitoring, infiltrations

## 1. INTRODUCTION

To curb such happenings on the border areas, the least that can be done is to provide constant monitoring. In current scenario, this monitoring takes place manually by the border security forces which are responsible for continuously keeping an eye on the borders. It takes a lot of manpower and assets as the borders are stretched across hundreds of miles and have extreme terrain as well as climatic conditions. Hence, the need of the hour is to design an automated border surveillance system which can perform the surveillance task without requiring any human assistance. It can eliminate the need of deploying humans at hostile conditions at all the times. Moreover, in case if something suspicious is detected by the system, it must be able to take the necessary decisions and hence actions along with issuing alert messages for the human controllers. The central control rooms can be set up at a distance from the border area. Once the human controller is aware of the intrusion, it is upon him to decide the next course of action.

Today our major concern is the security of the border of our nation. These borders are guided by our soldiers. These soldiers encounter threat to their lives due to infiltrations, cross border terrorism, drug peddlers etc. Due to these malicious elements, they make supreme sacrifice. If we could have save even half of life, we would have an even mattlesome force. These may not have been possible in past warmtimes, but today the scenarios are changing. We are advancing to a technological more dexterous globe. Terrains like rivers, valleys, hilly areas, fissures ,etc which are comparatively more difficult to guard and where it is more likely for our soldiers to risk their lives and meet martyrdom can now be stopped because of the IOT based technology. If anything, which arises suspicious occurs then, execution of predetermined tasks take place. Intrusion detection system IDS are integral part of border surveillance. They are designed to operate in hostile environment, to monitor, detect and track ,the intruders (moving targets), around

the clock. As it is really tiring for our soldiers to keep a track 24/7 through video streaming, intrusion detection which an generate automatic alerts can prove to be of great use.

### 1.1 Introduction to the project

**Scenario 1:** The potential intruder (an animal) is on the other side of the border and cannot be detected by the PIR sensors but is in the camera's field of view. Note that potential intruder here could be a human or an animal.

**Scenario 2:** The potential intruder (Human being with weapon) is close to the border fence and in the proximity of the PIR sensors as well as in the camera's field of view.).

**Scenario 3:** The intruder (an animal) has crossed the border fence and is still in the proximity of PIR sensors as well as in the camera's field of view.

**Scenario 4:** The intruder (Human being) has crossed the border fence and is still in the proximity of PIR sensors as well as in the camera's field of view.

### 1.1 Motivation

Border surveillance is the most important task in the field of national defense and security. To maintain peace and to ensure safety of a country's people, the borders need to be kept under 24/7 monitoring. Especially, under current circumstances, when activities like terrorist infiltrations and illegal movement of both living as well as non-living beings have become common, it becomes of utmost importance to strictly protect the border areas against such activities.

## 1.2 Problem identification

**Automatic Intruder Combat System:** A way to Smart Border Surveillance :presents a framework which combines the human target detection, tracking and face-recognition based human identification for surveillance purposes. Background subtraction is employed for the detection of moving targets. Face recognition involves detecting the face of the target. If face detection fails, then target tracking continues.

## 1.3 Algorithm

### Convolutional Neural Network:-

#### Step 1: Load DATASET:

load haar-cascade XML files using cv2.Cascade Classifier function

#### Step 2: Detection

Call the detector function once the XML file is loaded.

#### Step 3: Detect Faces

**Step 4:** For every face, crop faces and forward them for eye detection

**Step 5:** After finding the coordinates of the eyes (ex,ey,ew,eh) draw a bounding box around the eyes in the original picture.

**Step 6:** draw a bounding box around faces using coordinates(x,y,w,h) on the original picture.

## 1.4 Objectives

To curb such happenings on the border areas, the least that can be done is to provide constant monitoring. In current scenario, this monitoring takes place manually by the border security forces which are responsible for continuously keeping an eye on the borders. It takes a lot of manpower and assets as the borders are stretched across hundreds of miles and have extreme terrain as well as climatic conditions. Hence, the need of the hour is to design an automated border surveillance system which can perform the surveillance task without requiring any human assistance. It can eliminate the need of deploying humans at hostile conditions at all the times. Moreover, in case if something suspicious is detected by the system, it must be able to take the necessary decisions and hence actions along with issuing alert messages for the human controllers. The central control rooms can be set up at a distance from the border area. Once the human controller is aware of the intrusion, it is upon him to decide the next course of action

## 2. LITERATURE REVIEW

### 2.1 Existing System

Border areas are covered in a complete, efficient and centralized way. For country, the benefit is considerable: well-controlled borders imply a higher level of protection for populations, anticipation and neutralization of terrorist risks, containment of trafficking and illegal immigration.

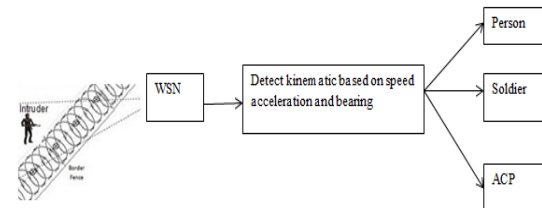


Fig:- Existing System Architecture

### 3. PROPOSED SYSTEM DESIGN

#### 3.1 Analysis of problem

Automatic intruder Combat System: A way to smart border surveillance presents a framework which combines the human target detection, tracking and face recognition based human identification for surveillance purposes. Background subtraction is employed for the detection of moving targets. Face recognition involves detecting a face of the target. If face detection fails, then target tracking continues.

#### 3.2 Design

Considering all the current security frameworks for identification and avoidance of intrusion or other activities, we propose smart border surveillance system which will go about as a person on patrol to look for any interruption and different activities like illegal trafficking and smuggling. It will alert the control room when image detection program detects an individual and also stream the exercises around the border to the control room. It will enable us powerful coordination with security team in the control room and quicker response time from the security.

We propose using a robot which will run on a double rail structure joined to the smart fence. The robot will be outfitted with the Raspberry Pi 4 module, a night vision camera, Distance sensors, motor driver, a 12V DC motor and a laser scanner (LiDAR).

#### 3.3 Advantages

1. Border areas are covered in a complete, efficient and centralized way.
2. For country, the benefit is considerable: well-controlled borders imply a higher level of protection for populations, anticipation and neutralization of terrorist risks, containment of trafficking and illegal immigration.
3. Provide larger security.
4. Usefull for Milletry.

#### 3.4 Architecture Diagram

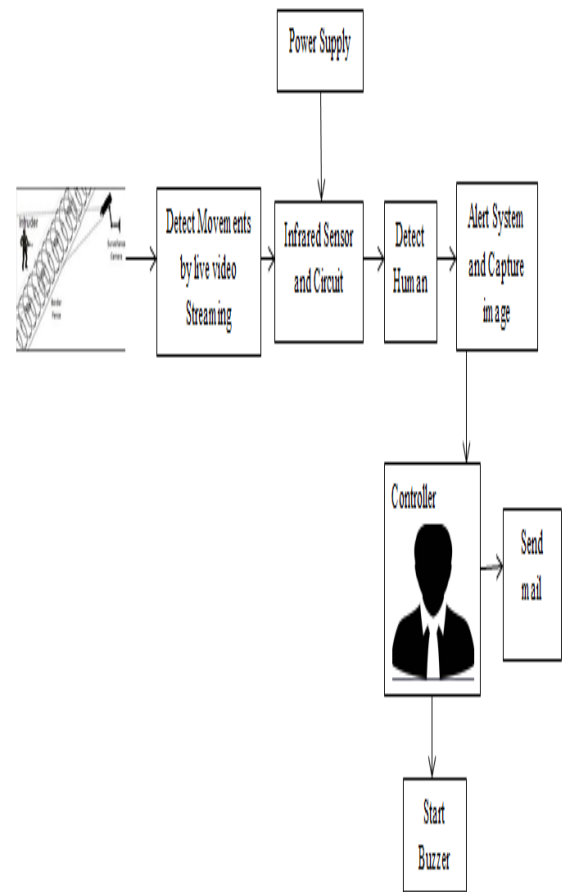


Fig: Architecture diagram.

## 4. CONCLUSION AND FUTURE SCOPE

### 4.1 Conclusion

The proposed system could be a great help in enhancing the security of our border regions especially, the areas facing extreme climatic or terrain conditions where human deployment is a major peril. Although the system may not be able to provide advanced border security but can surely provide solutions to border security surveillance on a small scale. As the system detects intruder, an alert message is generated along with the transfer of the snapshot of the intruder to the main system. Then, the appropriate steps are taken to eliminate the threat as the location of generation of the signal is also available.

### 4.2. Future Scope

In future, we can design this system for use on a larger scale. As with passing time the technology is constantly improving, the system can be equipped with more advanced and sophisticated hardware. The proximity sensors, object detection mechanism and response mechanism, if made using state-of-the-art technology, can make the working of the proposed system even more accurate and time-saving.

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