



Smart Border Surveillance System Using Deep Learning

Prof. Shegar S. R¹, Vidya D. Lamkhade², Pranali U. Mundhe² Pratiksha A. Yewale², Arti B. Zaware²

¹Professor of Department Computer Engineering,

² Student of Department Computer Engineering, Samarth Group Of Institutions College Of Engineering , Belhe.

snehashgar1@gmail.com vidyalamkhade1818@gmail.com , pranalimundhe2232@gmail.com, pratikshayewale150@gmail.com,
arratizaware2001@gmail.com.

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.

I. INTRODUCTION

The surveillance system is initiated to keep the areas safe and secure. This is done in order to maintain peace and free from certain abnormal activities and intruders. Border surveillance is the most important region in the field of security and safety. To maintain peace and to keep the area under control, the borders must be monitored by 24/7 continuously. Especially now-a-days, the terrorist attacks and their migration towards one's country keeps everyone at panic. so it is mandatory to strictly protect the border regions. To avoid such exercises at the border areas, certain initiatives has to be taken with at most care. It is done by allocating certain amount of soldiers or any type of security guards with armed forces at the border areas. This takes loads of manpower and property. Because the borders are very long and are of masses of miles with mountains and have extreme unbalanced climatic conditions.

The border surveillance systems are designed to monitor the borders and find out any intruder gets detected. If anything is detected, it involves alerting the control room or any concerned authorities with warning signal (buzzer, alarm, etc...). Intruder Detection is one of the parts of border surveillance system. This system is designed to monitor the environment, to detect the activities (object and face) and to recognize the humans who are restricted to such areas or environment. Since it takes long attention of man power to keep on monitoring the all the places from the control room, a system is set up to automatically alert when any intruders comes in. This is done by keeping a digital camera at the place, where to be monitored with at most care. If any person is detected, the face recognition takes place.

This is carried out using python code. In addition to this, a signal will be transmitted from the pi-module. The following system is designed to raise an alert signal at the monitor room or the place where it is to be mentioned. So, once an face is detected, automatically signal generated to receiver at other end through the transmitter. In such a case, when any signal is received by the receiver, the buzzer is triggered. Initially the buzzer is set in low. When a signal is received by the receiver, the pin is set to high so that buzzer will be active and generates sound to alert the administrations. This is done by using Arduino and embedded c coding at the other end. Once this process gets over, the buzzer will be activated and it makes sound until the process gets over or the system is again reset or only when it is turned off. This system can be further modified and is used according to the requirements. The surveillance system is upgradable based on the desired functions to be carried out as per the requirements and advancements.

2. LITERATURE REVIEW

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.

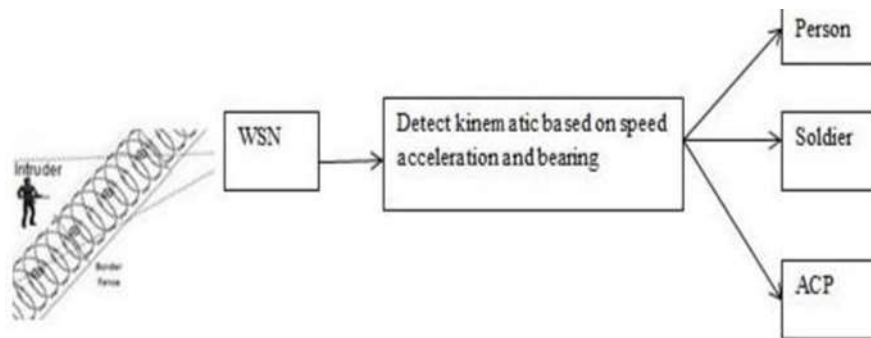


Fig:- Existing System Architecture

III. 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.

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.

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.

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.

IV. OBJECTIVES

- Border surveillance is the most important task in the field of national defense and security. In current scenario, this monitoring takes place manually by the border security forces which are responsible for continuously keeping an eye on the borders.
- Surveillance is used by citizens for protecting their neighborhoods. And by governments for intelligence gathering - including espionage, prevention of crime, the protection of a process, person, group or object, or the investigation of crime.

- 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.

V. PROPOSED SYSTEM DESIGN

Analysis of problem

In day to day life there is need to secure our boundry areas. Now the surveillance of border areas or any ohter secure place are done by using soldiers and security guards at each and every movements. To avoid such manpower on boundries and increases the security on boundry we develop such boder surveillance system.

VI. DESIGN

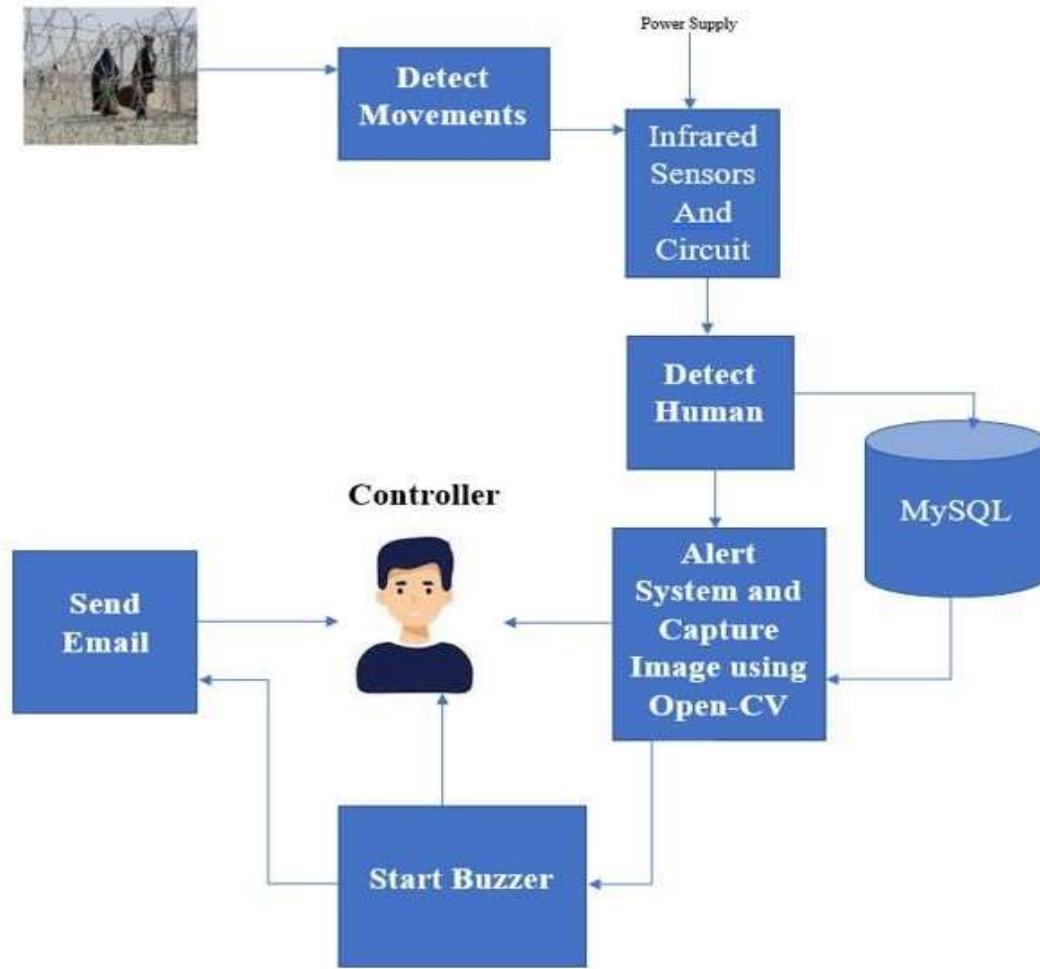
Considering all the current security frameworks for identification and avoidance of intrusion or other activities, we propose smart border surveillance system which will go about as a person on patrol to look for any interruption and different activities like illegal trafficking and smuggling. It will 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).

Advantages

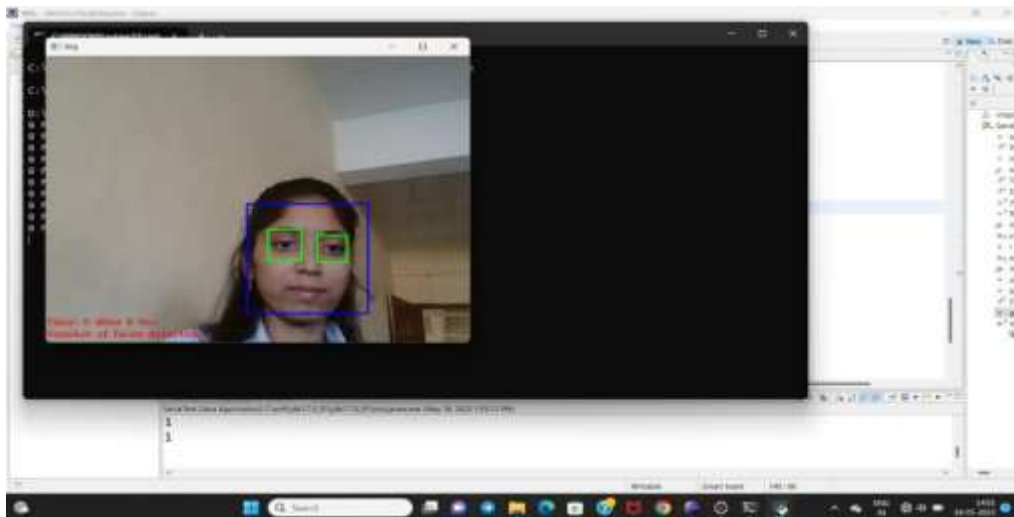
- 1) Border areas are covered in a complete, efficient and centralized way.
- 2) For country, the benefit is considerable: well-controlled borders imply a higher level of protection for populations, anticipation and neutralization of terrorist risks, containment of trafficking and illegal immigration.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

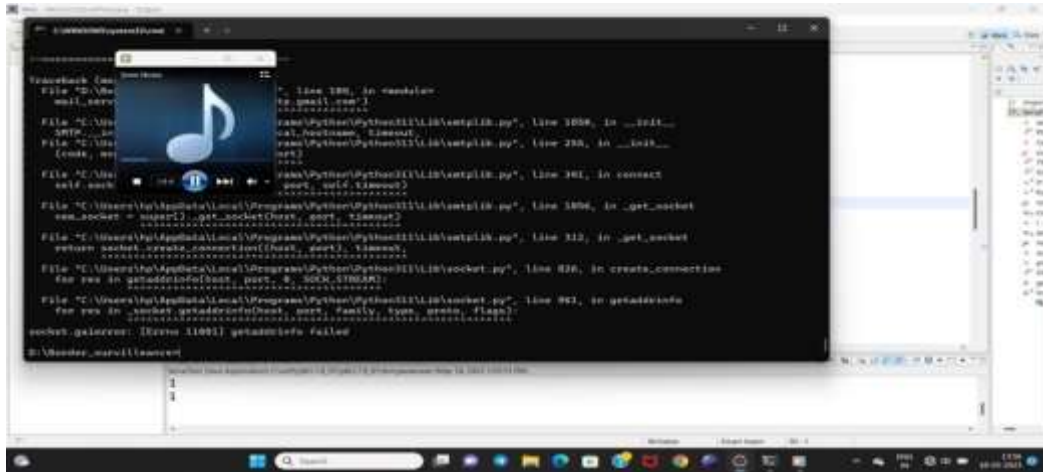
VII. ARCHITECTURE DIAGRAM



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.

VIII. RESULT





IX. 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.

X. REFERENCES

- 1) Palagati Harish, R.Subhashini, K.Priya, "Intruder Detection by Extracting Semantic Content from Surveillance Videos", International Conference on Green Computing Communication and Electrical Engineering (ICGCCEE), pp. 1-5, IEEE, 2014
- 2) Sagar R N, Sharmila S P, Suma B V, "Smart Home Intruder Detection System", International Journal of Advanced Research in Computer Engineering and Technology (IJARCET), Vol:6 No:4, pp. 439-443, 2017
- 3) Dushyant Kumar Singh, Dharmender Singh Kushwaha, "Automatic Intruder Combat System: A way to Smart Border Surveillance", Defense Science Journal, Vol:67 No:1, pp. 50- 58, 2016
- 4) Alazzawi, Lubna, Alkhatami, Mosad and Elkateeb, Ali. "Border Surveillance and Intrusion Detection Using Wireless Sensor Networks," International Journal of Advances in Engineering & Technology, 8, pp. 17-29, 2015.
- 5) Zhang, Lijing & Liang, Yingli. "Motion human detection based on background subtraction," 2010 Second International Workshop on Education Technology And Computer Science, pp. 284-287, 2010.
- 6) R. A. Deshmukh, Shubham Kamdi, Mohak Pingle, Shivani Rajee Bhosale, Asawari Bhosale, "Intelligent surveillance system using energy efficient intrusion detection and tracking techniques", 2nd International Conference on Electronics, Communication and Aerospace Technology (ICECA), pp. 1214-1218, IEEE, 2018
- 7) Sachin Umesh Sharma Dharmesh J. Shah. "A Practical Animal Detection and Collision Avoidance System Using Computer Vision Technique" in 2016.
- 8) Neha Patil, Shrikant Ambatkar and Sandeep Kakde. "IoT Based Smart Surveillance Security System using Raspberry Pi," International Conference on Communication and Signal Processing, April 6-8, 2017, India
- 9) Neha Bhadwal ; Vishu Madaan ; Prateek Agrawal ; Awadesh Shukla ; Anuj Kakran, "Smart Border Surveillance System using Wireless Sensor Network and Computer Vision", 2019 International Conference on Automation, Computational and Technology Management (ICACTM)
- 10) Gagandeep Singh Nagpal, Gagandeep Singh, Jappreet Singh, Nishant Yadav, "Facial Detection and Recognition using OpenCV on Raspberry Pi Zero", International Conference on Advances in Computing, Communication Control and Networking (ICACCCN2018)
- 11) D.Meena, R.Sharan, "An Approach to face detection and recognition," IEEE, Jaipur, India, December 2016.
- 12) Yundong Li ; Xueyan Zhang ; Hongguang Li ; Qichen Zhou ; Xianbin Cao ; Zhifeng Xiao, "Object detection and tracking under Complex environment using deep learning-based LPM", in IET computer vision 2019.
- 13) L.Cuimei, Qi.Zhiliang, J.Nan, W. Jianhua, "Human face detection algorithm via Haar cascade classifier combined with three additional classifiers", IEEE, Yangzhou, China, October 2017. Raspberry Pi" 2018 International Conference on Inventive Research in Computing Applications (ICIRCA)

-
- 14) Joseph Howse, "Training detectors and recognizers in Python and OpenCV", 2014 IEEE International Symposium on Mixed and Augmented Reality (ISMAR).
 - 15) L.Lang,W.Gu, "Study of Face Detection Algorithm for Real-time Face Detection System, " IEEE, Nanchang, China, May 2009.
 - 16) Suraj Pawar ; Vipul Kithani ; Sagar Ahuja ; Sunita Sahu, " Smart Home Security Using IoT and Face Recognition", 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA).
 - 17) Dwi Ana Ratna, Wati Dika Abadianto, "Design of Face Detection and Recognition System for Smart Home Security Application", 2017 2nd ICITISEE.
 - 18) Sun, Zhi, Wang, Pu, Vuran, Mehmet C., Al-Rodhaan, Mznah A., AlDhelaan, Abdullah M. & Akyildiz, Ian F. "BorderSense: Border patrol through advanced wireless sensor networks," Ad Hoc Networks 9, 3, pp. 468- 477, 2011.
 - 19) Yundong Li ; Xueyan Zhang ; Hongguang Li ; Qichen Zhou ; Xianbin Cao ; Zhifeng Xiao, " Object detection and tracking under Complex environment using deep learning-based LPM", in IET computer vision 2019.
 - 20) Pavithra.D, RanjithBalakrishnan "IoT based monitoring and control system for home automation", Proceedings of 2015 Global Conference on Communication Technologies (GCCT- 2015).