

Smart Tool for Security and Surveillance

Surya Prakash S¹, Shreyank J M²

¹Student, Dept. of ECE, National Institute of Engineering, Mysuru, India

²Student, Dept. of ECE, National Institute of Engineering, Mysuru, India

Abstract - "Smart Tool for Security and Surveillance" is a tool designed for educational institutions, industries, or organizations. This tool has various features, which include auto-detection of a person's face during their presence at a particular location, provides their details to the users using the tool, and in certain cases recommends the admin to take appropriate action. The design elements, working of the tool, appropriate software, and hardware used during the development of the tool have been mentioned in this paper.

Key Words: Convolution Siamese Networks, SQL, CSS, HTML, PHP

1. INTRODUCTION

Most of the time people have faced problems such as identifying a person's location in places that cover a huge area, such as industries, organizations, or even educational institutions. To overcome these problems, a tool named "Smart Tool for Security and Surveillance" has been developed. The tool takes inputs from the cameras, processes it, stores the details in Database, and updates it in real-time. Users using the tool can find out the latest exact location of a person in the given area. It also includes features like alerting the admin with an alert email and a burglar alarm, if a person is in an unauthorized area.

2. WORKING AND EXPLANATION

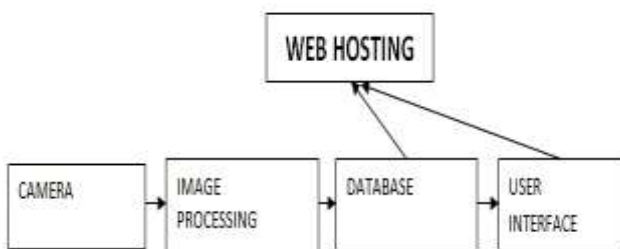


Fig -1: Block diagram of Smart Tool for Security and Surveillance

The types of cameras used by the tool are pre-installed cameras like CCTVs (Closed-circuit television) or wireless cameras. Input from CCTVs cameras can be from either VGA (Video Graphics Array) or HDMI (High-Definition Multimedia Interface) cables. Inputs can also be in the form

of video that is being live-streamed or from pre-recorded videos.

The video from cameras is a continuous frame of images. Considering an instant, each red, green and blue pixels of an image, range from 0 to 255 and it adds to a lot of combinations, hence to decrease this, the color image is converted to greyscale which is black or white, that is, 3 bytes of red, green and blue is converted to 1 bit, which is easy for computation.

The greyscale image is converted into equal frames and these frames are convolved with pre-trained data. To recognize multiple people, present in the area, each person's face is recognized in separate frames and convolved simultaneously. Since we are dealing with multiple cameras, we will be having many people to be reorganized simultaneously; hence we use multi-threading concepts to achieve better efficiency.

Since we deal with images to detect faces, we will use Convolution Siamese Networks.

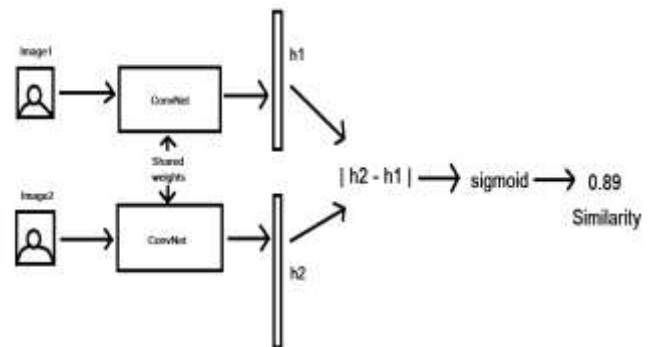


Fig -2: Siamese Network Architecture

We will have 2 images, one the input from the camera and the second one, the pre-trained image. First, the images are converted into frames and that into NumPy array. The data is sent through classifiers for extracting required features or regions of interest. We convolve a region of interest of the two images and from the result of convolution, we predict the person.

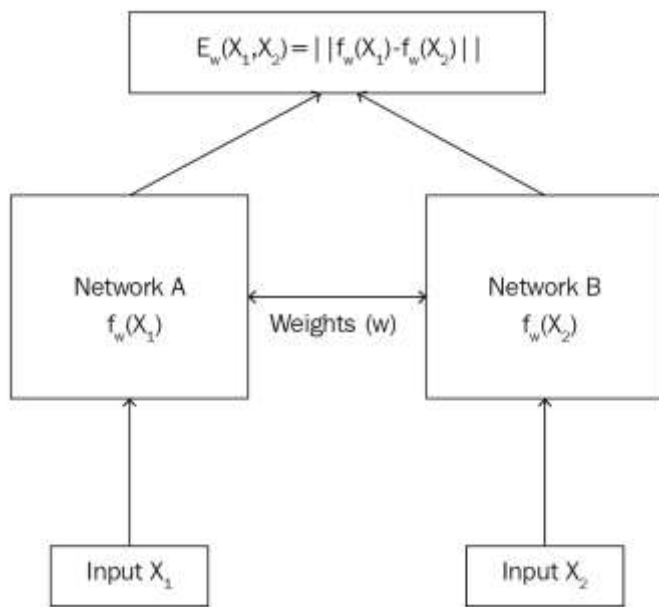


Fig -3: How Siamese Network Works

In the above diagram, Input X₁ is the input from the camera, and Input X₂ is the pre-trained data. The pre-trained data are images of all the people who are part of the organization. Inputs X₁ and X₂ are passed to Network A and Network B respectively. Network A consists of function f_w(X₁) which extracts the region of interest from Input X₁. Similarly, Network B consists of function f_w(X₂) which extracts the region of interest from Input X₂. E_w(X₁, X₂) calculates the dissimilarities between function f_w(X₁) and function f_w(X₂), which is the region of interest of the two images. When E_w(X₁, X₂) is least for a given combination Input X₁ and Input X₂, it is passed to the sigmoid function for the recognition of the person.

The result from convolution is passed through sigmoid function and the similarity score is predicted. If the score is more than 75%, then the person's details, such as his complete name along with his current location (the latest location of the camera from where the person's face is recognized) is updated in the Database. If the score is below 75% then a person is recognized as unknown.

If an unknown person is in a secure/unauthorized area, an alert e-mail is sent to the admin and security personnel and a burglar alarm is triggered. Also, if a person is recognized in a secure/unauthorized area, an alert e-mail is sent to the admin and security personnel.

A database is a collection of information that is organized so that it can be easily accessed, managed, and updated. The Database used in this project is the relational Database. A relational database is a type of database that stores and provides access to data points that are related to one another.

There are two types of Databases, the first, online database, and the second one, offline Database. An online database is a database accessible from a local network or the Internet. Online databases are hosted on websites, made available as software via a web browser. In an offline Database, we cannot access the database or modify the data and table structure outside the network and its usage is restricted only for LAN (local area network). In this case, it leads to overhead for a Database administrator, since the admin will have to manage the entire data of the organization.

In the case of institutions and industries, a Database containing all the details of various people who are a part of the organization is present. Whenever the similarity score predicted is more than 75%, the location column of the corresponding person is updated in the Database table. This is achieved through an update query. An Update Query is an action query (SQL (Structured Query Language) statement) that changes a set of records according to criteria specified and a huge number of records can be modified at one time.

To develop the content for the user, PHP (Hypertext Pre-processor) page is used for Web development, since its free and open source. A combination of CSS (Cascading Style Sheets), HTML (Hypertext Mark-up Language), and PHP is used for web designing and is hosted on the server. A user using the tool is provided with login credentials, containing a user name and a password. After which, the user is taken to a webpage, consisting of a Search Bar, where the user can search for a particular person, he/she is looking for. Using PHP, the required details of the person are retrieved from the relational Database using Structured Query Language with the help of a selection query. A selection query is used to retrieve the required data with certain restrictions. When a user enters a particular name to be searched, the SQL query retrieves the details of all possible homophones from the table and the details along with the location (the latest location of the camera from where the person's face is recognized) are displayed in the search results.

3. EXAMPLE OF USER INTERFACE IN CASE OF AN EDUCATIONAL INSTITUTION

Considering the case of an educational institute, here the students, faculty, and visitors are provided with login credentials. For example, for a student, the login Id will be his/her USN and a unique password will be provided. The user can log in to the webpage after which a search bar displayed. The user then enters the name of a particular person to be found and next the user is provided with the details of the person.

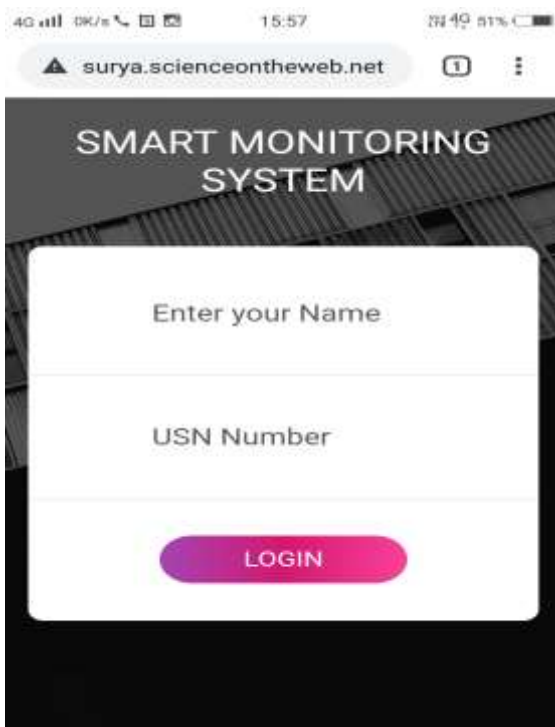


Fig -4: Login Page

In this particular user interface, the user logs into the webpage as shown in figure 4. In figure 5, the user has entered the name of the person to be searched as 's'. In figure 6, the results displayed are people whose name begins with the letter 's'.

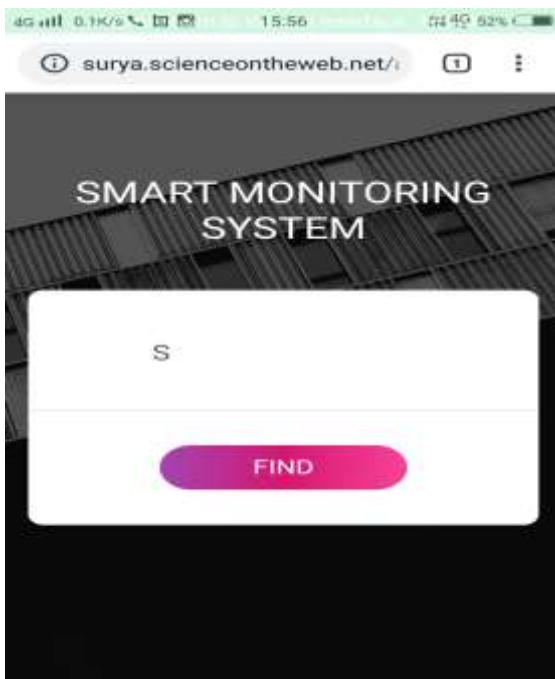


Fig -5: User Searching the name of the person



Fig -6: Search Results

4. CONCLUSION

In this paper, we have discussed how a tool namely "Smart Tool for Security and Surveillance" has been developed. This tool is used by the users to identify a person's latest known location in an organization such as industries or colleges and the tool also acts as an alert system for the admin and security personnel. This is achieved through, image processing of input data from different camera sources, and this data is processed and stored in the Database. The required details are made available to the user through a webpage that acts as a user interface.

REFERENCES

- [1] Aayushi Bansal, "A study of factors affecting Face Recognition", International Journal of Advanced In Management, Technology And Engineering Sciences, ISSN NO. 2249-7455
- [2] Kavita, Ms. Mangeet Kaur, "A survey paper for Face recognition Technologies", International Journal of Scientific And Research Publications, Volume 6, Issue 7, July 2016, ISSN NO. 2250-3153
- [3] Surya Prakash S, "Data Base Management Made Simple Through Python", ISBN 9781657067318

[4] Ayesha Jamadar, Anjali Deware, Gauri Kshirsagar, and Neha Khairnar, "Face Recognition using Deep Learning" IRJET Vol: 06 Issue: 06, June-2019, e-ISSN: 2395-0056, p-ISSN: 2395-0072

[5] Mrs. Madhuram.M, B. Prithvi Kumar, Lakshman Sridha, Nishanth Prem4, and Venkatesh Prasad, "Face Detection and Recognition Using OpenCV" IRJET Vol: 05 Issue: 10, Oct-2018, e-ISSN: 2395-0056, p-ISSN: 2395-0072

[6] Nikita Raut and Varun Dhuldhoya, "A Review on Various Techniques for Face Detection" IRJET Vol: 05 Issue: 10, Oct-2018, e-ISSN: 2395-0056, p-ISSN: 2395-0072

[7] Anubhav Kumar Singh, Manish Gupta, Akashay Kumar Singh, Mayank Kumar Singh, and Mehul Gupta, "Analysis & Study of Face Recognition and Detection" IRJET Vol: 07 Issue: 04, Apr-2020, e-ISSN: 2395-0056, p-ISSN: 2395-0072

BIOGRAPHIES



SURYA PRAKASH S

B.E (Electronics and Communication Engineering)
The National Institute of Engineering, Mysuru, India



SHREYANK J M

B.E (Electronics and Communication Engineering)
The National Institute of Engineering, Mysuru, India