CRIMINAL DETECTION AND IDENTIFICATION USING AI AND IOT

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ABSTRACT

A person is uniquely identifiable by their face, which is an essential component of the human body structure. As a result, it can be utilized to track down a criminal's identify. With the development of technology, several public locations now have cameras that can record illegal activity. Using the previously captured faces and criminal's images that are available in the crime database, the criminal face recognition system can be implemented. The implementation of computer vision for the automation of the criminal detection can substantially improve the crime situation of the city. An automatic criminal identification system that enhances and upgrades the criminal identification as more effective and efficient approach through the use of CNN. The CNN model is trained on the criminal dataset and then deployed for achieving criminal detection. The Decision Tree approach is also deployed which considerably enhances the precision of the detection. Once the criminal is detected the system generates an alert to notify the law enforcement that can significantly reduce the crime levels in the locality. The proposed approach has been quantified through comparison with the conventional approaches to yield highly satisfactory outcomes.

Keywords: Face Recognition, Face Detection, Microsoft AZURE Cognitive Services, Face API, HAAR, Machine Learning, Cloud

INTRODUCTION

Over the years, a lot of security approaches have been developed that help in keeping confidential data secured and limiting the chances of a security breach. Face recognition which is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness is a computer program that uses a person's face to automatically identify and verify the person from a digital image or a video frame from a video source. It compares selected facial features from the image and a face database or it can also be a hardware which used to authenticate a person. This technology is a widely used biometrics system for authentication, authorization, verification and identification. A lot of company has been using face recognition in their security cameras, access controls and many more. Facebook has been using face recognition in their website for the purpose of creating a digital profile for the people using their website. In

developed countries, the law enforcement create face database to be used with their face recognition system to compare any suspect with the database. In other hand, in Malaysia, most cases are investigated by using thumbprint identification to identify any suspect for the case. However, because of unlimited knowledge through internet usage, most criminals are aware of thumbprint identification. Therefore, they become more cautious of leaving thumbprint by wearing gloves except for non-premeditated crimes. This Project to propose a facial recognition system for a criminal database where the identification of the suspect is done by face matched rather than thumbprint matched.

LITERATURE SURVEY

Microsoft Kinect Sensor is used for detecting faces [1]. Kinect has a RGB sensor and a IR sensor. CCTVs have a RGB sensor with IR LEDs for night vision. The device detecting the faces was Kinect with its vast hardware and sensors. These faces were passed on in a cropped manner to the system. Used a Ann to train the system using 4 faces. The Ann was trained on Azure. The processing was done by a PC104+ embedded system. The link between the PC104+ system and the Windows Azure cloud infrastructure was a 3G wireless connection. The system was overall very fast with speeds sometimes around 200ms.The method used several sub methods like skin detection although he most prominent was face detection

[2].The Algorithm used was the Haar Cascade Classifier. HAAR Cascade classifier mainly works by finding patterns with reference to black and white rectangles. This particular paper used a advanced implementation which also involved diagonals. Every Face is modeled as an ellipse. Skin detection is used to speed up Haar face detection .This is only detection not recognition. It is a multistep process where every frame was analyzed

[3]. First step was detection using Haar classifier. Second step was detecting face using both Eigen Faces and Gabor algorithm, third step was decision making and selecting. The accuracy was around 50 percent because of changes in illumination pose…etc. The authors used method which specifically used Microsoft Azure to compute data

[4]. This project main aim was to find objects in the environment for robot to navigate. The paper used the SIFT and SURF Algorithm as its main object detection strategy .SIFT finds objects by identifying blobs .Another technique is to try a direct match .The user interface was a windows from C# application. Authors used the method which used a technique to determine the consistent background

[5]. This paper made use of 2 cameras to prevent any disturbance from lighting. The one particular method they used was background subtraction. The specific algorithm was the MOG background subtraction. Long term and shorter analysis is done in case someone come back to pick up his luggage. Algorithm used was the MOG background subtraction. Long term and shorter analysis is done in case someone with increasing terrorist activities there was augmenting demand for video surveillance. Mostly images are generally classified based on the value of simple features

[6]. It is always better to use features rather than using pixels as feature based systems always operates much quicker than pixel based systems. In this approach the algorithm consists of 3 intermediate steps:

SCOPE OF THE PROJECT

Scope of Criminal Detection is explained below

Facial recognition software (FRS) is defined as a biometric tool used to match faces in images, usually from photos and video stills, against an existing database of identities. It can be broken down into three parts — detection (finding a face in an image), analysis (face mapping), and recognition (confirming identity).

An example of facial recognition technology is the auto photo tagging feature on Facebook or even Google Photos. Social media and tech giants like these map a user to the face in the photo by sorting through

their existing database of uploaded images. Since facial features are much more complex than other existing biometric methods like fingerprints and the eye's iris, FRS tools require complex, artificially intelligent algorithms.

According to a 2021 report Opens a new window by NIST, facial recognition algorithms now have an average error rate of just 0.08%, compared to the 4.1% in 2014. Neural networks and deep learning technology have significantly evolved since then, enabling significant development in 3D recognition software. It's not just the underlying algorithms, we now have more powerful microcontrollers and processors and advanced camera technology for lenses and on-chip processing. Access to this hardware in the form of smartphones has become a boon to the FRS industry.

Early this year, Juniper Research reported opens a new window that facial recognition hardware such as Apple's Face ID is the fastest growing form of biometric smartphone hardware. It is estimated that over 800 million smartphones will be using them by 2024. Considering the advancements in technology and the accelerated market growth, this would be the right time to incorporate facial recognition technology into your business.

METHODOLOGY

The methodology for Criminal Detection is developed under waterfall model architecture as shown in the below figure 1.

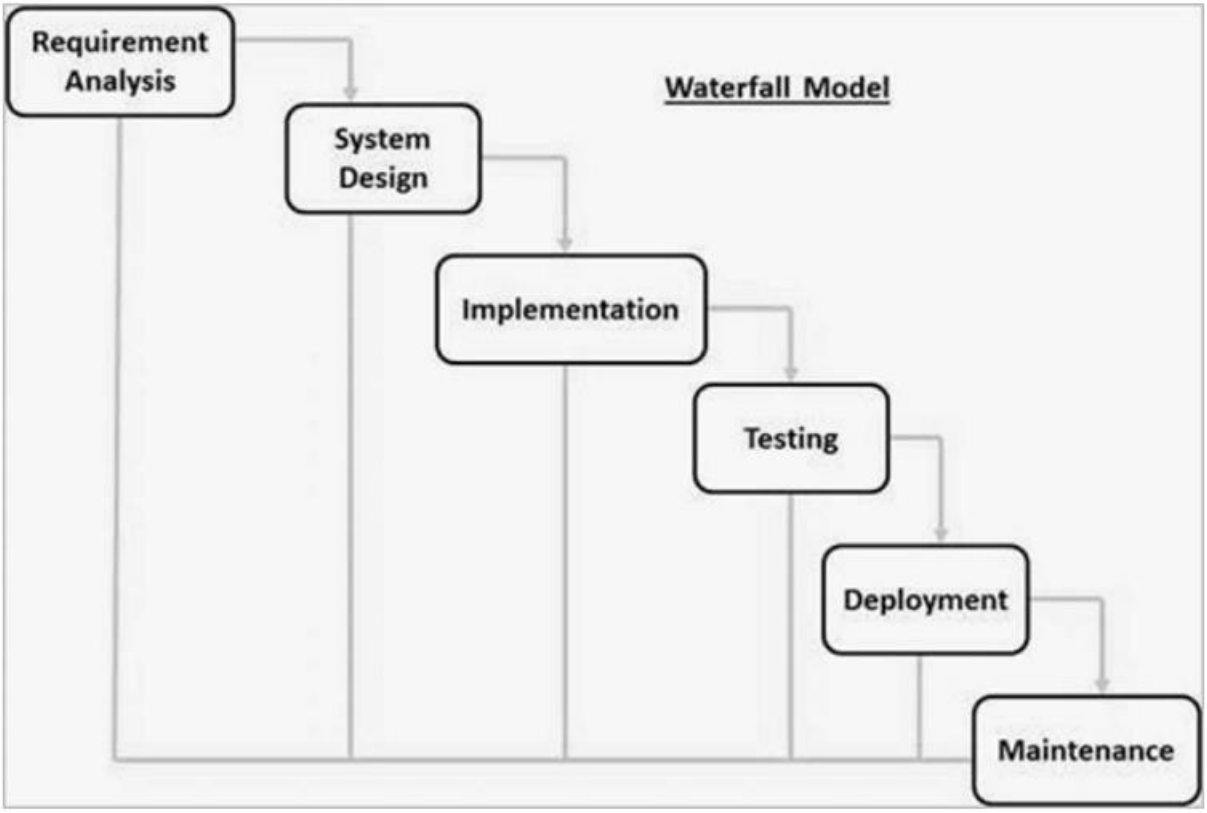


Fig 1 : Water fall model Architecture

The sequence phases in water fall model according to our project are mentioned below.

1 Requirement Analysis – Here requirement analysis are done based on following points

- ✓ Base paper for Criminal Detection System
- ✓ Studying on Convolution Neural Networks

2 System Design: The System of Criminal Detection is designed by using the following hardware and software's

1 Minimum Hardware Specification:

- Processor: Dual Core of 2.2 GHZ
- Hard Disc: 100 GB
- RAM : 2GB

2 Software Specification:

- Platform: Python , Java
- Technology : Python 3.9, JDK 1.8
- IDE: Spyder 5.0 , Netbeans 8.2
- Database : Mysql 5.0
- Libraries : Keras, Tensorflow

3 Implementation:

Proposed system is designed by using the following modules

Module A: Preprocessing

- Image Scaling
- Image Sharing
- Image restoration
- Dataset list formation

Module B: Image Normalization

- Pixel Position
- Color Model
- Model Features
- Region Estimation

Module C: Convolutional Neural Network

- ROI Extraction
- First Layer Convolution
- Fully Connected layer
- Convolution Rate

Module D: Decision Tree

- Test Image data
- Model initialization
- If-then rules
- Criminal Identification

5 Deployment of the system:

The developed software is deployed in the laptop of above mentioned configuration with the help of the mentioned software.

6 Maintenance of the system:

As this software is tested for the quick recovery, so maintenance of the system is not a challenging task. This is because the tools and the software used are open source, so there is no question of licensing the required software.

DETAILS OF DESIGN, WORKING AND PROCESSES

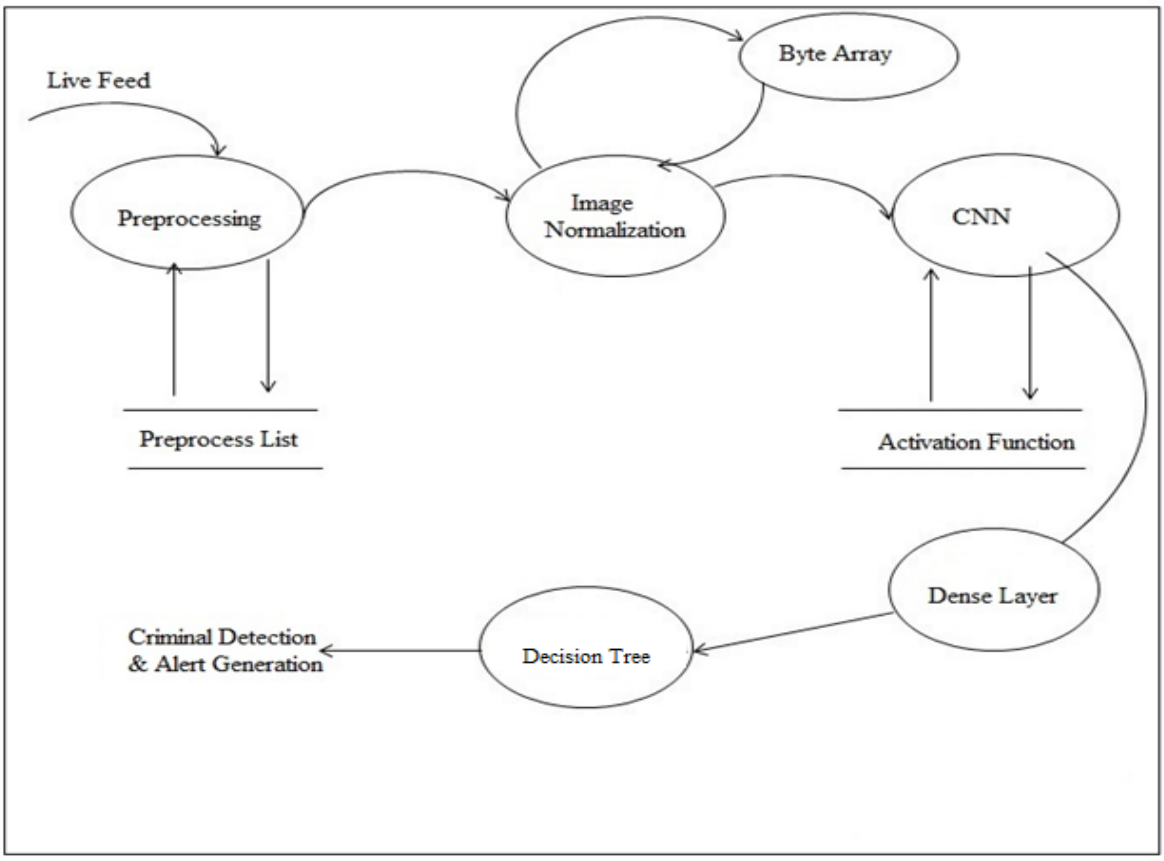
1 DETAILS OF DESIGN

1 Data Flow Diagram

DFD level 2

Fig 4 DFD level 2

The DFD 2 diagram is the most detailed wherein the user provides the Live feed from which the preprocess list is



generated and image normalization is utilized through byte array. The system then deploys CNN through Activation function and dense layer formation following which the Decision Tree is applied to get Criminal Detection and Alert generation.

3.3.2Activity Diagram

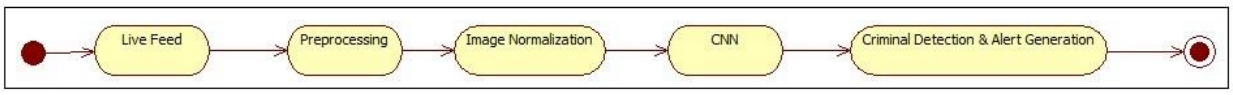
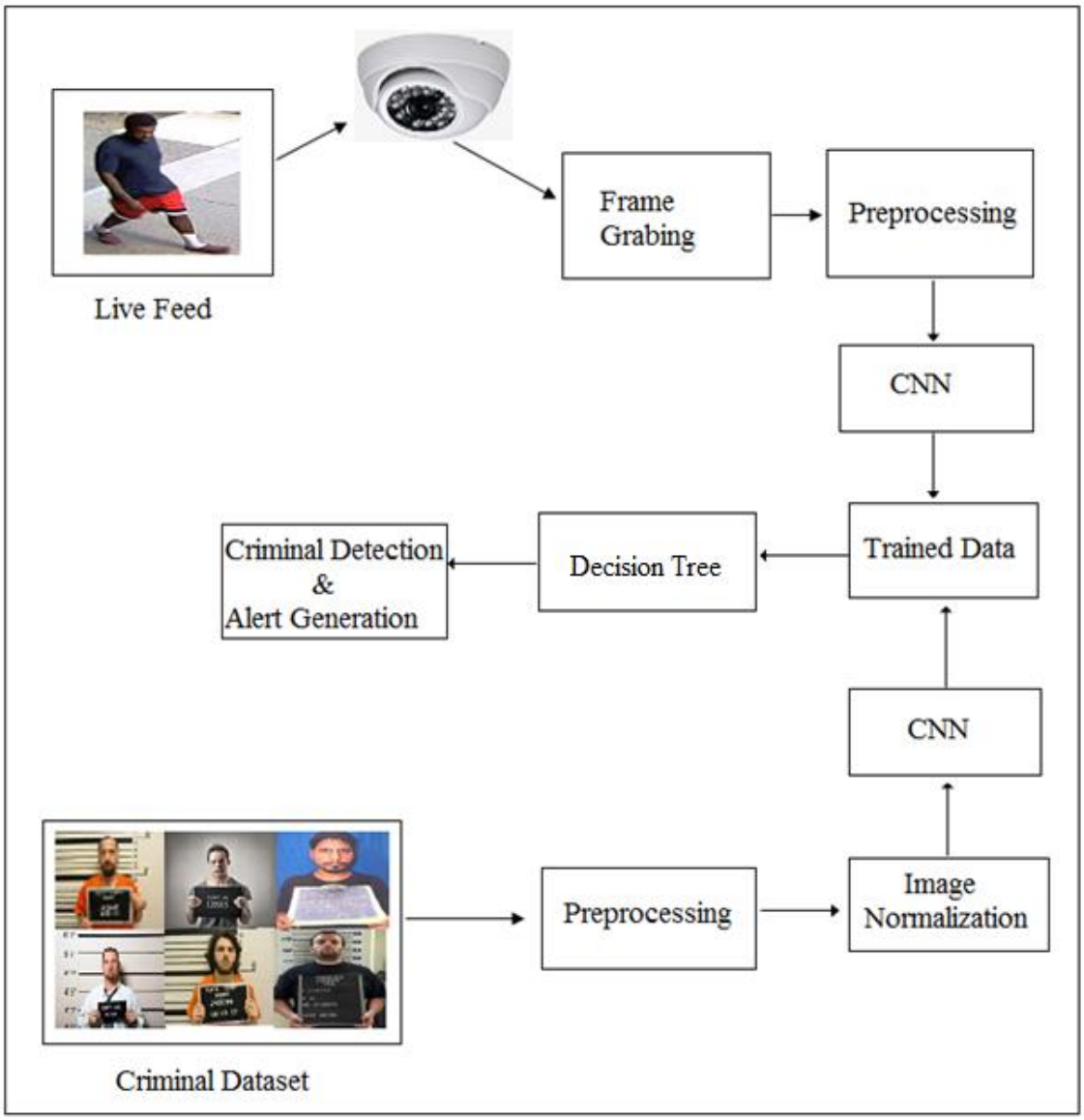


Fig 5 Activity Diagram

The activity diagram lists the various activities that are performed in the proposed methodology, the start state is initiated and the user provides the live feed, preprocessing, image normalization, CNN which results in the Criminal Detection and Alert generation.

WORKING AND PROCESSES



The system overview diagram provides an overview of the system with the important modules in the form of blocks. At first the user provides the criminal dataset which is preprocessed and the images are normalized before sending to the Convolutional Neural Networks to achieve the trained data. The user then provides the live feed the frames from which are grabbed and preprocessed following that the CNN trained data is deployed.

CONCLUSION AND FUTURE SCOPE

Criminals are the integral identity of the any society, so to unleash them a strong mechanism is required by the many sectors like banking, Woman Safety, Social Justice and other sector. The deep learning models are considered as the one of the best solution for this, Hence, this research is concentrated on the implementation of convolution neural network for the verification of the real time Criminals. This research weaved in the sense of

verifying the Criminals of the society by the law enforcement agencies. Before this process Criminal images are trained using the Convolution neural network. While testing the Criminal images are uploaded by the admin to verify it as criminal or non-criminal. If the Criminals are found then a precautionary Email will be send to Concern department through Gmail host.

FUTURE SCOPE

For the future research purpose this model can be enhanced to work as the readymade API and also as the web services to provide services to different sectors of law enforcement departments.

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