FINGERPRINT IMAGE IDENTIFICATION FOR CRIME DETECTION

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ABSTRACT

Fingerprint images in crime scene are important clues to solve serial cases. In this paper we present a complete crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network (CNN). Images are acquired from crime scene using methods ranging from precision photography to complex physical and chemical processing techniques and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to categorize. Suitable enhancement methods are required for pre-processing the fingerprint images. Minutiae are extracted from the fingerprint images. The features of preprocessed data are fed into the CNN as input to train and test the network. The experimental results demonstrated on database using Open CV-Python shows high accuracy of 80% recognition a partial or full fingerprints in the criminal database.

Key Words—Convolutional Neural Network, Image acquisition, Image pre-processing, Open CV, Python
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1. INTRODUCTION

FINGERPRINTS in the crime scene plays an important role to identify the criminal involved in the crime. Crime scene images (CSI) are images taken from the crime spot. When crime is occurred, the investigator takes both latent and patent sample of fingerprints left behind.

The patent fingerprints are visible by naked eye, so they are simply photographed. But latent fingerprints are invisible and these samples are more difficult to perceptible. These samples can be lifted through different techniques. The use of cyanoacrylate vapors which sticks to prints and make them visible in the present of normal light. This method is much difficult, so normally in crime scene, the investigators apply a fine dusting powder (aluminium

dust or black granular) to the surface in which fingerprints to be extracted. The dust actually sticks to the fingerprint then they use clear tape to lift the fingerprint. After the lifting the fingerprints, the prints are scanned and saved in the digital image form. The fingerprints taken from the crime scene is unintentionally made and these images are noisy or partial prints and difficult to identify

To moderate this problem, the fingerprint images are subjected to image pre-processing, image feature extraction and identification analysis. Here we use image preprocessing techniques to improve image quality with the aim of enhancing local level features called minutiae. After minutiae extraction the fingerprint data will proceed

to training using CNN network. For training, training-set will take if dataset has 2000 images, the 1500 fingerprint images are used for training and remaining 500 fingerprint images are used for testing.

An investigator takes the fingerprints at the crime scene and compares it with database of old criminals. After the image pre-processing techniques, the CNN system will extract the feature and then, the criminals identified are ranked according to their similarity features to the fingerprint images and gives the accuracy of identification

2. LITERATURE SURVEY

Pavithra [1] proposed an algorithm for crime scene fingerprint image detection by using Convolutional Neural Network (CNN). Images acquire from crime scene is complex in physical appearance. So, image pre-processing and feature extraction is used are fed into the CNN and accuracy of 80% is achieved.

B. Wenxuan [2] proposed an algorithm which is focused on feature extraction by the edges of the fingerprint obtained. For this purpose clustering with neighboring points.

O. I. Abiodun [3] focused using artificial neural network (ANN) for feature extraction from the fingerprint images and identification purpose. The experimental result of the proposed algorithm with some existing algorithms such as GAN, SAE, DBN, RBM, RNN, RBFN, PNN, CNN, SLP, MLP, MLNN.

Serafim [4] proposed an algorithm which is used to segment region of interest in fingerprint image using convolutional neural networks (CNN) without pre-

processing steps.

Han [5] proposed fingerprint image enhancement technique termed as adaptive median filter which is used to remove impulse noise. Its performance is measured with existing median filter and it outperforms better with respect to traditional method.

3. SYSTEM ANALYSIS
Existing System

Fingerprints in the crime scene plays an important role to identify the criminal involved in the crime. Crime scene images (CSI) are images taken from the crime spot. When crime is occurred, the investigator takes both latent and patent sample of fingerprints left behind. The patent fingerprints are visible by naked eye, so they are simply photographed. But latent fingerprints are invisible and these samples are more difficult to perceptible. These samples can be lifted through different techniques. The use of cyanoacrylate vapours which sticks to prints and make them visible in the present of normal light. This method is much difficult, so normally in crime scene, the investigators apply a fine dusting powder (aluminium dust or black granular) to the surface in which fingerprints to be extracted. The dust actually sticks to the fingerprint then they use clear tape to lift the fingerprint. After the lifting the fingerprints, the prints are scanned and saved in the digital image form. The fingerprints taken from the crime scene is unintentionally made and these images are noisy or partial prints and difficult to identify.

Proposed System

The CNN uses successive convolutional layers with a non-linear ReLu function for storing the features of an image having a specific dimension. Maxpooling layers are used for down sampling. The fully connected layer multiplies the input by a matrix with sigmoid activation function and adds to a bias vector which contains the feature map. The images obtained from the crime scene are called crime scene images (CSI).

These images play important role and used as evidence in criminal cases. The fingerprint information contained in the images collected directly from the crime scene may be partial or tough to identify. This can lead to fingerprint images of bad or low quality. Due to the low quality of fingerprint image to another systematic image feature, the early fingerprint image quality may be of exterior value of identification.

To moderate this problem, the fingerprint allows to perform image pre-processing, to feature mark up and identification analysis. Segmentation is a first step in image enhancement which converting low-level image processing transforming a gray scale image into high-level image description in terms of features, objects and

scenes. It partitions an image into distinct region

System Architecture
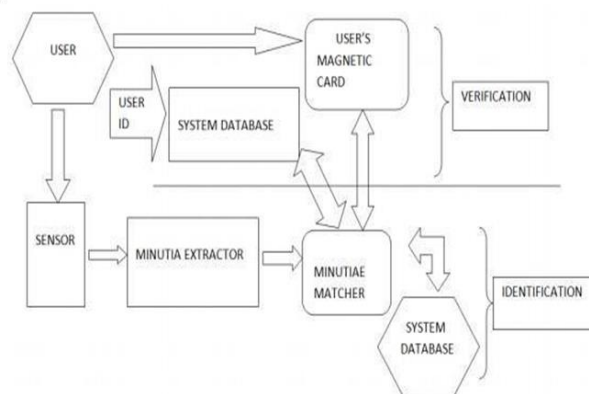
4. SYSTEM REQUIREMENT SPECIFICATION

Introduction

The project involved analyzing the design of few applications so as to make the application more users friendly. To do so, it was really important to keep the navigations from one screen to the other well ordered and at the same time reducing the amount of typing the user needs to do. In order to make the application more accessible, the browser version had to be chosen so that it is compatible with most of the Browsers

Purpose:

In order to make the application more accessible, the browser version had to be chosen so that it is compatible with most of the Browsers.

Hardware Requirements

For developing the application following are the Hardware Requirements:

- Processor: i3 processor
  - RAM: 4GB Space on Hard Disk: 1TB

Software Requirements

For developing the application following are the Software Requirements:

- Windows 10
- Python using anaconda

**Technologies and Languages used to Develop**

Python

5. PRESENT WORK WITH DIAGRAMS

The purpose of the design phase is to plan a solution of the problem specified by the requirement document.

This phase is the first step in moving from the problem domain to the solution domain. In other words, starting with what is needed, design takes us toward how to satisfy the needs. The design of a system is perhaps the most critical factor affection the quality of the software; it has a major impact on the later phase, particularly testing, maintenance. The output of this phase is the design document. This document is similar to a blueprint for the solution and is used later during implementation, testing and maintenance. The design activity is often divided into two separate phases System Design and Detailed Design.

Use Case Diagram

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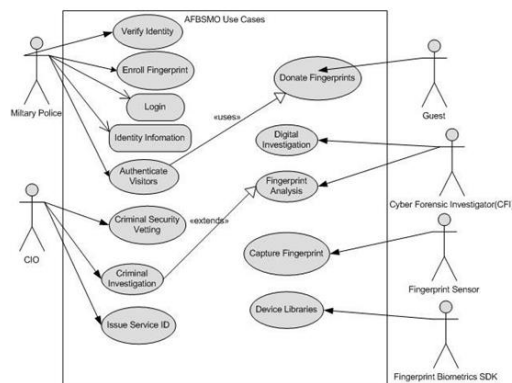
IMPLEMENTATION

Deep Learning:

Deep learning is based on the branch of machine learning, which is a subset of artificial intelligence. Since neural networks imitate the human brain and so deep learning will do. In deep learning, nothing is programmed explicitly. Basically, it is a machine learning class that makes use of numerous nonlinear processing units so as to perform feature extraction as well as transformation. The output from each preceding layer is taken as input by each one of the successive layers. Deep learning models are capable enough to focus on the accurate features themselves by requiring a little guidance from the programmer and are very helpful in solving out the problem of dimensionality. Deep learning algorithms are used, especially when we have a huge no of inputs and outputs. Since deep learning has evolved by machine learning, which itself is a subset of artificial intelligence and as the idea behind artificial intelligence is to mimic human behavior, so is "the idea of deep learning to build such algorithms that can mimic the brain". Deep learning is a collection of statistical techniques of machine learning for learning feature hierarchies that are actually based on artificial neural networks.
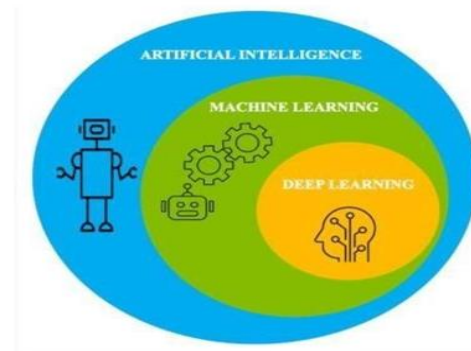
INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction

data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

What data should be given as input?
How the data should be arranged or coded?
  ➢   The dialog to guide the operating personnel in providing input.
Methods for preparing input validations and steps to follow when error occur

OBJECTIVES

1.   Input Design is the process of converting a user-oriented description of the input intoa computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

2.   It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier

and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

3.   When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1.   Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2.Select methods for presenting information.

3.Create document, report, or other formats that contain information produced by the

system.

The output form of an information system should accomplish one or more of thefollowing objectives.

- Convey information about past activities, current status or projections of the
- Future.
- Signal important events, opportunities, problems, or warnings.
  - Trigger an action.Confirm an action

SCREENS AND REPORTS
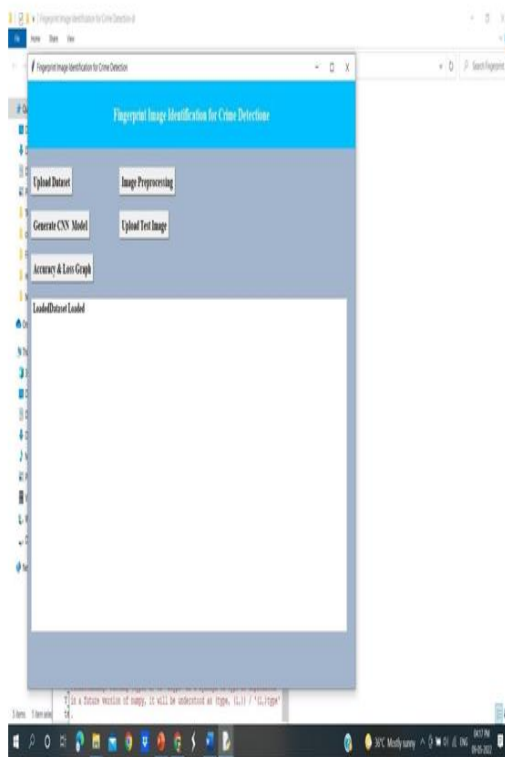
In the above Screen We can click the upload dataset and then loaded the dataset

In the below screen ,image processing can know the how many images are there in the dataset
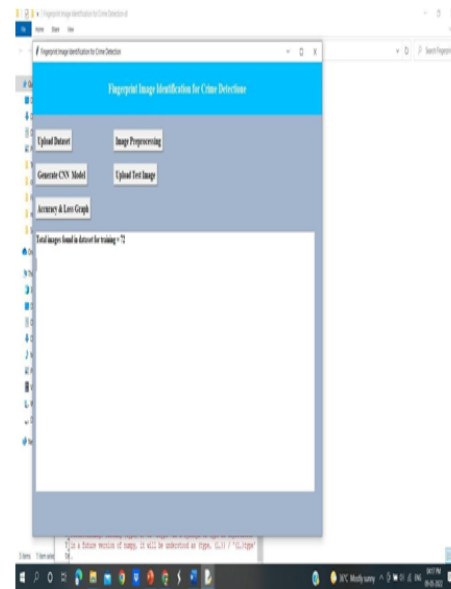
After we can generate the cnn model ,we know the accuracy

Conclusion

Fingerprint identification system used for identifies the criminal who involved in the crime helps to automate fingerprint identification process. Pre-processing was performed with Otsu thresholding, fingerprint thinning and minutiae extraction with Cross-Number method. Feature extraction will be done by the CNN classifier. The performance of SVM and CNN based classifiers are analyzed. It is observed CNN gives better performance compared to SVM because of its deep learning ability to learn relevant features from the image. Using CNN classifier, improved fingerprint identification accuracy of 80% is achieved.

Future work

Fingerprint images in crime scene are important clues to solve serial cases. In this paper we present a complete crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network (CNN). Images are acquired from crime scene using methods ranging from precision photography to complex physical and chemical processing techniques and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to categorize. Suitable enhancement methods are required for pre-processing the fingerprint images. Minutiae are extracted from the fingerprint images. The features of preprocessed data are fed into the CNN as input to train and test the network

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