Journal of Engineering Sciences

Vol 13, Issue 06, June/2022
ISSN NO:0377-9254

FINGERPRINT IMAGE IDENTIFICATION FOR CRIME DETECTION

[1]Dr. M. Rudra kumar [2]K. Anil Kumar [3]P. Bhargav [4]S. Joshi sulakshan [5]K. Ajay

[1] GUIDE PROFESSOR [2,3,4,5] U.G.SCHOLAR

DEPARTMENT OF CSE

G PULLAIAH COLLEGE FOR ENGINEERING AND TECHNOLOGY , KURNOOL

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.

I. 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

With the introduction of biometrics technology which is an advanced computer techniques now widely adopted as a front-line security measure for both identity verification and crime detection, and also others an effective crime deterrent. In an increasingly digital world, reliable personal authentication has become an important human computer interface activity. Fingerprint recognition could be very complex pattern recognition problem. It is difficult to design accurate algorithms that are capable of extracting prolific features and comparing them in a robust way, especially in poor quality fingerprint images and when low-cost acquisition devices with small area are adopted. There is a greatest misconception that the fingerprint recognition is a fully solved problem considering it was one of the first applications of all amongst machine pattern recognition.

Biometrics

Biometrics is an automated method that recognizes people based on their physical and action characteristics, and is a field that used to authenticate a certain individuals characteristic, recognize a person's character, or study a person's measurable characteristics. Among the different biometrics, like face, hand, iris, voice and many others, fingerprints is the most dominant biometric technology in commercial applications due to their distinctiveness, persistence, accuracy, throughput, size and cost of readers.

II. 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.

III. Existing System

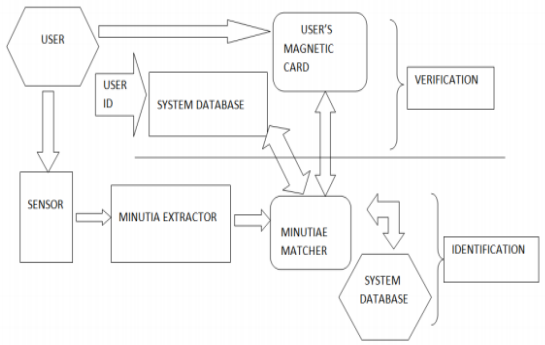
Fingerprints in the crime scene plays an important role to identify the criminal involved in the crime. Crime scene images (CSI) are images taken from the crime spot. When crime is occurred, the investigator takes both latent and patent sample of fingerprints left behind. The patent fingerprints are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

IV. 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 containing each pixel with similar characteristics. Fingerprint skeletonization is used to reduce ridges until one pixel wide. The fingerprint features like minutiae are extracted from the skeleton images. The ROI is extracted using open and close operation by discarding the image areas without effective ridges and terminates. The remaining effective area is divided into two areas, to determine bound the white area used and to represents the inner area the gray area used.

V.SYSTEM ARCHITECTURE:



5.1 Modules Description

I. Data Collection

Firstly, Dataset can be collected from various sources of any organization. The right dataset helps for the prediction and it can be manipulated as per our requirement. Our data is in the form of images it may be based on night, fog, and rainy. The data can be collected from the organization based on the areas where the weather can be seen unusual. By collecting these it makes accurate in prediction.

II. Data Processing

All the data was collected, the data is in the form of the images. Images are collected by the use of driving recorder and the image set is established for training.in the first step the matching values for all pixels and all disparities are calculated. In the second step the disparity values are interpolated to sub-pixel accuracy by fitting a quadratic curve to the matching values in the neighborhood of the best matching value.

III. Training

the Data Deploying the Model After the data has been prepared and transformed, the next step was to build the classification model using the support vector classifier technique. This technique was selected because the construction of support vector classifiers does not require any domain knowledge. By using the attribute, we have considered in the dataset we train the model by using the algorithm. The training sets are used to tune and fit the models.

IV. Deploying

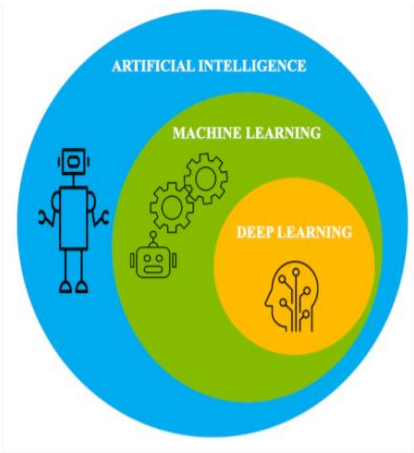
the model the classification rules are generated from the support vector. The trained data can be used for the Testing the data. It helps to give the output or accurate prediction of weather using this model.

Feature Extraction

Feature extraction is a process of dimensionality reduction by which an initial set of raw data is reduced to more manageable groups for processing. A characteristic of these large data sets is a large number of variables that require a lot of computing resources to process. Feature extraction is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be processed, while still accurately and completely describing the original data set.

VI.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.



VII. Future Enhancement

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

VIII. 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.

13. References

[1] Anil K. Jain, and Jianjiang Feng, "Latent fingerprint matching," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2014, pp. 2452-2465.

[2] Mohammad Mogharen Askarin , KokSheik Wong and Raphael C-W Phan ,"Reduced contact lifting of latent fingerprint", In Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC), IEEE, 2017, pp. 1406-1410.

[3] Cao, Kai, Eryun Liu, and Anil K. Jain, "Segmentation and enhancement of latent fingerprints: A course to fine ridge structure dictionary," In IEEE Transactions on Pattern Analysis and Machine Intelligence, 2014, pp. 1847-1859.

[4] Ramaiah, N. Pattabhi, A. Tirupathi Rao, and C. Krishna Mohan, "Enhancements to latent fingerprints in forensic applications," In 79th IEEE International Conference on Digital Signal Processing, 2014, pp. 439-443.

[5] Mouad.M.H.Ali, Vivek H.Mahale, Pravin Yannawar A Gaikwad, "Fingerprint Recognition For Person Identification and Verification Based On Minutiae Matching," In IEEE 6th International Conference on Advanced Computing, 2016, pp. 332-339.

[6] Wahid Zafar,Tasweer Ahamad and Muhammad Hassan, "Minutiae Based fingerprint Matching Techniques," In 17th IEEE International Multi Topic Conference, 2014, pp. 411-416.

[7] Joan Del Espiritu, Giselle Rolluqui and Reggie C. Gustilo, "Neural network based partial fingerprint recognition as support for forensics", In International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM), IEEE, 2015, pp. 1-5.

[8] Ying Liu, Fuping Wang and Dan Hu, “Multi-Feature Fusion with SVM Classification for Crime Scene Investigation Image Retrieval,” In 2nd International Conference on Signal and Image Processing (ICSIP), IEEE, 2017, pp. 160-165.