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System for Fingerprint Image Analysis

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Abstract: *As we know the fingerprint is unique of every living objects. It is quite difficult to find out the prints. Usually the Forensics use Fine powder and duct tapes to identify the prints of living object. As powder is exceptionally muddled, so such molecule can cause loss of information after that examination the information is coordinated with the system. The proposed system consists of an embedded device in which it consists of ultra light to glow the fingerprints details. After that we can detect the fingerprint, analysis and it will checks on the database, and it will return the output after matching. For matching and analysis of the Fingerprint, we will be using the Algorithm for matching.*

Keywords *– Fingerprint Identification, Image Processing, Machine learning, Open Cv, ultraviolet light.*

1. INTRODUCTION

The Embedded system is designed to do a specific task, design engineers and can advance to decrease the size and cost of item and increment the unwavering quality and performance[5].The Embedded systems are generally found in consumer,automotive, medical,industry and military applications. As this isn't insignificant to accomplish, we will try a bit by bit approach, moving from straightforward recognition to more complex Fingerprint recognition.The system will be tried utilizing different kinds of tests. Simple tests are introduced to check parts of the system. At last a last test with pictures of real criminal fingerprints will show the activities of the total.The proposed system we are implementing the embedded device is to identify the criminal fingerprint by using the ultraviolet lights to identify the unique finger impression of the criminal[6]. By applying the different procedures the images are transformed into suitable format to match the fingerprint details.

2. LITERATURE REVIEW

Pavithra. R and K.V. Suresh[1]. In this paper they present a crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network. Pictures are gained from crime scene using various strategies ranging from exactness photography to complex physical and substance handling methods and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to understand. Appropriate enhancement methods are required for pre processing the fingerprint images. Minutiae techniques are extracted from fingerprint images. The features of pre-processed data are fed into the CNN as input to train and test the network.

Samet Taspinar, Husrev T. Sencar, Sevinc Bayram and Nasir Memon[2].In this paper the work present another new methodology that improves the efficiency of pairwise camera fingerprint matching and incorporates group testing to make the search more effective. Specifically we mutually leverage the individual qualities of composite fingerprints. Fingerprint processes in a novel way and plan two strategies that are better than existing methodologies. The outcomes show that under very high-performance requirements, where the probability to identify is close to one. the proposed search methods are 2 to 8 times faster than the normal search methods.

Pablo David Gutiérrez, Miguel Lastra, Francisco Herrera, and José Manuel Benítez[3].we present a GPU fingerprint unique matching system dependent on MCC. The many core focus processing system hardware platforms offer an opportunity to enhance the unique fingerprint matching. Data structure, calculation and memory move,the system that keeps its exactness and arrives at a precise speed contrast with a reference consecutive CPU execution. A rigorous experimental examination over capture fingerprint databases shows the capability of our system. The results open up a totally different field of conceivable outcomes for real time unique fingerprint identification in large databases.

Chenhao Lin and Ajay Kumar[4].A new way to deal with precisely coordinating such unique mark pictures. Robust thin plate spline is made to increase the model flexible fingerprint distortions using splines. In order to correct such distortions on the contact based fingerprints, RTPS based generalized fingerprint distortion correction model is proposed. The usage of DCM brings the exact adjustment of key minutiae character observed on the contact less and contact based prints. The leads to this paper, using two publicly available databases, validate our process and to achieve outcoming results for matching contactless 2Dimensional and get in touch with based unique fingerprint images.

Turki Aljrees, Daming Shi, David Windridge, William Wong[5].In this paper, a modified k-mean algorithm is proposed by applying the k mean algorithm. The data point has been allocated to its various appropriate classes or the cluster more remarkably. The k mean algorithm decreases the complex nature of the numerical arithmetical, mathematical, fractional, exponential, logarithmic computation, thereby retaining the effectiveness of applying the k mean algorithm to the values. The outcome shows that the altered K-means algorithm leads to a better way of observing the data to discover groups and their similarities and dissimilarities in the criminal dataset as a specific domain.

Mouad.M.H.Ali,Vivek H. Mahale,Pravin Yannawar,And A. T. Gaikwad[6].In this paper,the Recognition system is divided into four steps.The first is the Acquisition step to capture the fingerprint image, The second step is the Pre processing stage to enhance, binarize, thinning fingerprint image. The Third stage is Feature Extraction Stage to extract the feature from the thinning image by using minutiae extraction methods to extract ridge ending and ridge bifurcation from thinning. The fourth step is matching Identification, Verification to match two minutiae points by using a minutiae matcher method in which similarity and distance measures are used.

Richa Jani and Navneet Agrawal[7].The paper prefer the score level of fusion with feature extraction which it will be established to combine the scores attained by fingerprint and vein and a new approach fusion with alignment that are credible and therefore the integration strategic which will be espoused to overlapped the features attained by fingerprint and vein.Fusion techniques include processing biometric modalities successively until an adequate match is obtained.

HAO GUO[8].In this paper, a Fresh method of fingerprint matching method is introduced, which is based on the Fixed hidden markov model HMM that is used for modeling the fingerprint's orientation field, is described in this paper. The exact,durable and same strong fingerprint matching can be easily found by the same Fixed Hidden Markov Model parameters which were built after the processing the extracting features from a fingerprint, forming the models of examination vectors and training the embedded hidden markov model parameters.

C.Worawong,W.Phutdhawong,and S.Jirasirisak[9].In this paper the development of fluorescence chemicals in the detection of latent fingerprints on a nonporous surface has been studied. The properties of aromatic chemicals, anthracene and naphthalene have been examined. UV light at a wavelength of 365 nm was used as a detector. The fingerprint development was evaluated by counting the resulting minutiae using automated fingerprint identification system (AFIS). The outcomes showed great sensitivities only for anthracene.The effect of temperature on the fingerprints appearance was also studied. The latent fingerprint which was developed by anthracene was no longer observable at temperatures above 100°C.

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Stefan Kiltz, Mario Hildebrandt,Jana Dittmann,and Claus Vielhauer[10].In this article we analysis and brief the present state of the art of appropriate sensing and pre-processing methods and identify challenges, the necessity for the mixing of various process models, the determination of sensor parameters, the selection of sensor types for various surfaces, the challenge posed by non-planar surface, the influence of dust and dirt, the age separation and detection of overlapping fingerprints and the ongoing extension of an existing benchmarking scheme.Beside single-sensor tuning and multi-sensor fusion approaches for quality improvement of 3D scan data for localisation, acquisition and analysis of fingerprint traces.

Naja M I and Rajesh R[11].In this paper, The performance of a Minutiae extraction algorithm relies heavily on the quality of the input fingerprint images. Here introducing a quickly fingerprint enhancement procedure, which may adaptively improve the clarity of ridge and valley structures of fingerprint images supported the estimated local ridge orientation and frequency and determine the performance of the photos improvement algorithm using the goodness index of the extracted features minutiae and therefore the accuracy of a web fingerprint verification system.

Xiang Ming, Wu Xiaopei and Hua Quanping[12].In this paper, a new thinning system based on the center from the block is presented. The new system checks the nine into nine near neighbours around the pixel to search out the center pixels of the portion, and other pixels are removed from that area. The method is performed constantly.It's stop when less than ten pixels are removed from one loop. To guarantee the ridge is one pixel wide, a post-processing loop is meant and therefore the pixels are removed from the image if they Fulfill some states. The outcomes results are wont to compare with this newest system to other systems and their relative performances are assessed. The new system is faster than the other systems and the ridges are one pixel wide after thinning.

Damir Demirović, Emir Skejić, Amira Šerifović-Trbalić[13]. In this paper image processing algorithms were evaluated, which are capable of executing in parallel manner on several platforms CPU and GPU. All algorithms were tested in TensorFlow, which is a novel framework for deep learning, but also for image processing. Relative speedups compared to CPU were given for all algorithms. TensorFlow GPU implementation can outperform multi-core CPUs for tested algorithms, obtained speedups range from 3.6 to 15 times.

.Selvarani M.C.A.,M.Phil,S.Jebapriya M.C.A.,M.Phil,R.Smeeta Mary M.C.A.,M.Phil [14].Fingerprint alteration refers to the deliberate alteration of the fingerprint pattern by an individual for masking his/her identity. This paper presents a replacement method for detecting and identifying altered fingerprints supported fingerprint orientation field reliability. The primary present of this paper are compiling case study of incidents where individuals were found to possess altered their fingerprints,analysis by investigating the impact of fingerprint alteration on the result of a billboard fingerprint matcher,categorize the changes into three major parts and suggesting possible countermeasures,developing a way to automatically find altered fingerprints supported analyzing orientation field. The outcomes show the possibility of the projected approach in detecting altered fingerprints and highlight the necessity to further pursue this problem.

Abinandhan Chandrasekaran,Dr.Bhavani Thuraisingham[15].In the paper, the system proposes to match two fingerprints provided that their minutiae points are identified already. In order to check and confirm our system, we used the procedure to select the minutiae points from the given fingerprint image data. In short, does fingerprint image boost based on Short Time Fourier Transform analysis to enhance the overall clearness of a fingerprint image and also provides it in a binary format. We use it to obtain the enhanced binary image, after which we thin down the binary image down to a width of one pixel so as to recover minutiae points from the image. It leads to two steps in order to get the product of a matching score. In the first step, the technique is used to obtain the simple minutiae point set minutiae points present in both the base and the input image is explained. In the second phase, the technique to perform actual matching based on the common minutiae point.

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3. Analysis Table

The Table given below is a summary of research papers shows analysis of different literature papers on Identification, and Large database which focuses on different techniques used in the paper and their advantages and disadvantages.

Table 1. Analysis Table

Sr No	Title Name	Techniques	Advantage	Disadvantage
1	Fingerprint Image Identification For Crime Detection.[1]	Convolutional Neural Network (CNN) as input to train and test the network.	Using CNN classifier, improved fingerprint identification accuracy.	It requires a large amount of dataset.
2	Fast Camera Fingerprint Matching In Very Large Databases.[2]	The composite-digest search tree approach is approximately 2 times faster than CFST and LSFD.	Fingerprint digest ideas speed up the task of source camera identification with no performance drop.	The increase in the number of fingerprints, the share of each fingerprint in the composite will decrease and the match decision will become less reliable.
3	A High Performance Fingerprint Matching System For Large Databases Based On Gpu.[3]	Minutia cylinder-code (MCC) is used for matching the large database	In this paper, we present a GPU(Graphics Processing Units) fingerprint matching system based on MCC(Minutia Cylinder Code).	Discarded minutiae more sensitive to errors and deformations and therefore less reliable.
4	Matching Contactless And Contact-based Conventional Fingerprint Images For Biometrics Identification.[4]	In order to correct such deformations on the contact-based fingerprints, RTPS-based generalized fingerprint deformation correction model (DCM) is proposed.	The fingerprint scale correction algorithm described in previous section results in better alignment between the contactless and contact-based fingerprint images.	Improvement in the accuracy for such matching.
5	Criminal Pattern Identification Based On Modified K-means Clustering.[5]	k-mean algorithm is proposed.	We can quickly identify how many k-mean clusters are needed to initialize the centroid point that will lead to better clustering.	Time consuming.
6	Fingerprint Recognition For Person Identification And Verification Based On Minutiae Matching.[6]	Minutiae extractor methods to extract ridge ending and ridge bifurcation from thinning.	Accuracy is equal to Previous system.	Large dataset required

7	Biometric Security Using FingerPrint Recognition.[7]	Fusion techniques include processing biometric modalities successively.	By using sensors the extraction is easily done.	Comparatively complex to design.
8	A Hidden Markov Model Fingerprint Matching approach..[8]	Hidden Markov Model (HMM)	The performance is good and robust.	Sensitive to the noise and distortions of a fingerprint image.
9	The Study of Fluorescent Chemicals for Fingerprint Development.[9]	The fingerprint development was evaluated by counting the resulting minutiae using automated fingerprint identification system(AFIS).	The prints developed by Anthracene display greater clarity than those developed using Naphthalene on every surface in this study.	Fingerprints did not appear to give useful results under any of the selected light sources.
10	Challenges In Contact-less Latent Fingerprint Processing In Crime Scenes.[10]	Using new contact-less acquisition sensors enables a more detailed investigation of a trace	Increased significantly recently to overcome disadvantages of traditional dactyloscopic techniques.	The contact-less acquisition, dust and dirt can degrade and in rare cases enhance (semi-) automated processes.
11	Fingerprint Image Enhancement: Algorithm and Performance Evaluation.[11]	Minutiae extraction technique	Improve the clarity of ridge and valley structures based on the local ridge orientation and ridge frequency estimated from the inputed image.	Corrupted fingerprint images and they are extremely harmful to minutiae extraction.
12	A Fast Thinning Algorithm for Fingerprint Image.[12]	Thinning Algorithm checks the 9*9 local neighborhoods around the pixel to find out the centroid pixel of the block, and other pixels are removed.	An effective thinning algorithm should reduce ridges to one pixel thickness and has high speed.	Algorithm turns out to be not the perfect algorithm for thinning because it does not work on all images.
13	Performance of some image processing algorithms in TensorFlow.[13]	All algorithms were tested in TensorFlow, which is a novel framework for deep learning, but also for image processing.	The performance of tensorflow is good	From the experiments we cannot expect significant improvements for GPU using CUDA
14	Automatic Identification and Detection of Altered Fingerprints.[14]	A new method for identifying and detecting altered fingerprints based on fingerprint orientation field reliability.	A set of features are rst extracted from the ridge orientation eld of an input fingerprints and then a fuzzy classifier is used to classify it	The lack of public databases containing altered fingerprints has further research on this topic.

15	Fingerprint Matching Algorithm Based on Tree Comparison using Ratios of Relational Distances.[15]	Fingerprint image enhancement based on STFT (Short Time Fourier Transform) analysis to improve the overall clarity of a fingerprint image and also provides it in a binary format.	The algorithm considers only those points that feature in the Candidate Common Point List to create the tree.	It requires a bulky database to matching.

4. Material and Method

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.It also requires high-end hardware to train the images.It has additionally been demonstrated that this camera unique mark is difficult to expel or produce and endures a large number of activities performed on the picture, for example, such as blurring,scaling,compression,noise,etc.

Figure: normal Image taken

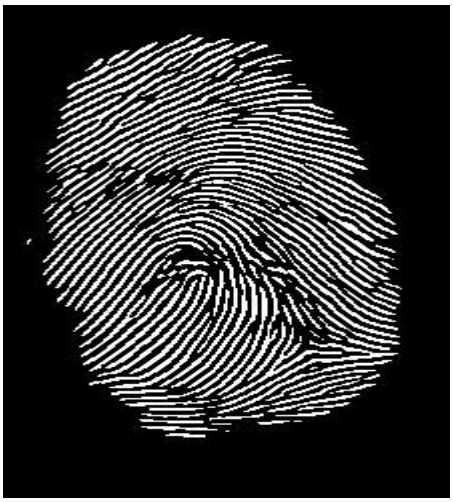

Figure:Filter Apply Image

The fingerprints shown in the crime scene are obtained from the crime spot are converted into digital image form and these images are formed as dataset[1]. After the image acquisition the pre-processing method was done, for image pre-processing analysis and it will check on the database[3], and it will return the output after matching.

The ultimate goal of Fingerprint recognition is to be able to recognize an Criminal no matter what the circumstances (surface, condition,temperature,etc.). As this can be not unimportant to attain, we are going to attempt a step by step approach, moving from straightforward shape acknowledgment to more complex Unique mark recognition.The framework will be tried utilizing distinctive sorts of tests. Basic tests are presented to check parts of the framework. In the end a final test with pictures of actual criminal fingerprints image will show the workings of the complete system[2]. All of the work portrayed has been actualized and tried in Python.The made versatile frameworks are tried as completely as conceivable. Due to the imperatives of computational control and time in some cases tests have been less broad in arranging to create ways for testing more varieties.

5. CONCLUSION

We trained an Embedded system model at a portable platform and applied the trained model into an Embedded System. As a baseline, we have our system model trained by Raspberry pi 3 flow. What does the future hold for Fingerprint Identification Given sufficient entrepreneurial originators and adequate inquire about and advancement dollars, Fingerprint Detection can become a most valuable tool for future applications. Fingerprint Detection is a very difficult task considering the diversities that exist in ordinary penmanship. However, progress is being made to make it vast and accomplish it at more advanced level. The Fingerprint Detection using Embedded System can be enhanced in various kinds of ways such as Training and Detection speeds can be expanded more prominent and more prominent by making it more user-friendly. Many applications exist where it would be desirable to detect multiple objects.

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