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СОВРЕМЕННЫЕ ДОСТУПНЫЕ БАЗЫ ДАННЫХ ОТПЕЧАТКОВ ЛАДОНИ: ОБЗОР

Отпечаток ладони является уникальным и очень полезным биометрическим признаком. За последние несколько десятилетий по этой теме было проведено достаточно исследований. Разработаны и успешно реализованы различные алгоритмы и системы. Так как данный метод не позволяет получить более расширенную информацию для распознавания личности, мультиспектральные или гиперспектральные изображения и распознавание отпечатков ладоней могут стать потенциальным ответом на эти системы. Биометрические технологии широко используются в сфере безопасности для аутентификации и идентификации в течение последних нескольких лет. Для повышения точности и скорости требуется улучшенная система распознавания. В этой статье рассматриваются некоторые современные базы данных отпечатков ладоней, а также описаны используемые методы и их точность. Лицо, отпечаток пальца, радужка глаза, отпечаток ладони, руки являются физиологическими биометрическими данными. Из всех биометрических, физиологическая биометрия предлагает больше всего преимуществ. База данных бесконтактных изображений ладоней PolyU-IITD составлена с помощью ручной камеры, включает жителей Индии и Китая. База данных бесконтактных отпечатков ладоней IIT Touchless Palmprint получена от студентов и преподавателей Delhi India, база состоит из полных изображений рук. База данных гиперспектральных отпечатков ладоней создана Гонконгским политехническим университетом, была собрана в отделе биометрической исследовательской лаборатории с помощью жидкокристаллических фильтров Meadowlark. Многоспектральная база данных отпечатков пальцев, гиперспектральная база данных были составлены китайскими исследовательскими группами учёных. База данных отпечатков пальцев polyU собрана у 193 человек, содержит 386 ладоней. Китайская академия наук разработала базу данных отпечатков ладоней CASIA с помощью собственного устройства распознавания отпечатков ладоней. База данных отпечатков пальцев XJTU собирается с помощью гаджетов iPhone 6S, HUAWEI mate8, LG G4, Samsung Galaxy Note5 и MI8. Также представлен литературный обзор современных исследований в данной области. Отмечены преимущества гиперспектральных изображения по сравнению с мультиспектральные изображениями, гиперспектральные изображения отпечатков ладоней очень трудно подделать.

Биометрический; отпечаток ладони; база данных; гиперспектральный; мультиспектральный.

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MODERN AVAILABLE PALMPRINT DATABASES: A REVIEW

The palm print is a unique and very useful biometric. A lot of research has been done on this topic over the past few decades. Various algorithms and systems have been developed and successfully implemented. Since this method does not provide more advanced information for personality recognition, multispectral or hyperspectral imaging and handprint recognition could be a potential answer to these systems. Biometric technologies have been widely used in the security industry for authentication and identification over the past few years. An improved recognition system is required to improve accuracy and speed. This article reviews some modern handprint databases and describes the methods used and their accuracy. Face, fingerprint, iris, palm print, hands are physiological biometric data. Of all biometrics, physiological biometrics offers the most benefits. The PolyU-IITD non-contact palm image database compiled with a handheld camera includes residents of India and China. The database of IIT Touchless Palmprints is sourced from Delhi India students and teachers and consists of complete hand images. The database of hyperspectral fingerprints created by the Hong Kong Polytechnic University was collected in the

Biometric Research Laboratory Department using Meadowlark liquid crystal filters. The Multi-spectral Fingerprint Database, Hyperspectral Database was compiled by Chinese research teams of scientists. The polyU fingerprint database was collected from 193 people and contains 386 palms. The Chinese Academy of Sciences has developed the CASIA handprint database with its own handprint recognition device. The XJTU fingerprint database is collected using iPhone 6S, HUAWEI mate8, LG G4, Samsung Galaxy Note5 and MI8 gadgets. A literature review of current research in this area is also presented. The advantages of hyperspectral images compared to multispectral images are noted, hyperspectral images of palm prints are very difficult to fake.

Biometric; palmprint; database; hyperspectral; multispectral.

Introduction. In today's generation, there is a rapid and widespread adoption of technology and devices such as mobile phones and the Internet, where some personal data of the user is stored and protected by passwords and patterns that are easily cracked, and where biological features can be used for all security and privacy concerns. Biometric technology has been increasingly used in security to produce authentication and identification during the last few years. Physiological and behavioural biometrics are the two forms of biometrics [1]. Face, fingerprint, iris, palmprint, hand etc. are physiological biometrics; behavioural biometrics include gait, keystroke, and signature. All the biometrics, physiological biometrics offer the most advantages [2]. Identification and verification are the two most common recognition modes for biometrics systems. The term "identification" refers to a one-to-many comparison that answers the query, "Who is this person?" Verification is a one-to-one comparison that answers the question "is the person who claims to be who he says he is?" Palmprint recognition has gotten a lot of interest from researchers as one of the new biometrics techniques [3]. There are various biometric qualities, each with its own set of characteristics. Palmprint has a big area to get more features, the palm print is more reliable, and the palm print may be used with images of poor quality [4] [5]. Palm-related features, as well as major features like ridges, valleys, and minutiae point primary lines, exhibit great accuracy in all biometric features. Where the palmprint has a large ROI, it can be taken at a lesser resolution and from a larger distance with a less costly sensor or DSLR camera, making it less expensive [6]. Palmprint have low distortion, good stability, and high uniqueness when compared to other biometrics. Previously, classic natural light imaging systems could only gather palmprint images in grayscale forms. Hyperspectral and multispectral palmprint imaging are novel approaches that have recently been applied to improve the performance and accuracy of classic natural light imaging systems. The palmprint technique may record the palm in a range of spectrums, ranging from 3 to 10, with the most common being red, green, blue, and near-infrared (NIR) spectral bands. As a result, each spectral band highlights various aspects in comparison to the natural light image, allowing for more information to be obtained in order to improve a palmprint identification system [7].

Several internet palmprint databases are available, according to the research. Which the researcher collects according to their research requirements, with varying illumination, size, and pixels Contactless contact based devices with various age groups were used to acquire some information.

Database Review

1) PolyU-IITD Contactless Palmprint Images Database (Version 3.0)

PolyU-IITD Contactless Palmprint Images Database is acquired from people of India and china from the various locations with help of hand-held camera. This database is acquired from 600 different subjects which is the largest until August 2020 literature. The database is collected from the age group of 5 to 72 years from different population group that includes non-officer works, farmers, countryside laborers, injured palms and hands with special capabilities or injuries. The database provides each 10 images of left and right hand it means 20 images of each person. The images in this database have high scale variations. This database contains fingerprint images taken over 15 years and is one of the unique contributions of this database. This database is available to researchers from December 2018 [8].

2) IIT Delhi Touchless Palmprint Database (Version 1.0)

The IIT Touchless Palmprint Database is acquired from the students and the teachers of IIT Delhi India the database consist of full hand images. The database collected in the year of July 2006 to June 2007 by using simple and touchless imaging setup. The database acquired in the indoor climate and enroll circular fluorescent illumination on all side of the camera lens. The all the images are in bitmap format (*bmp) collected from 230 peoples from the age group of 12 to 57 years old the resolution of each image is 800 x 600 pixels. Seven images are taken of each left and right hand from different position. The all images have sequentially numbered in integer number. This database is available to the researcher from October 2007 [9].

3) Hypherspectral Palmprint Database

In the Hong kong polytechnic university the big hyperspectral palmprint database was collected in their department of biometric research lab with the help of liquid crystal tunable filter system which is made by meadowlark some charge couple device was used made by cooke corporation with help of Osram halogen light of 500 W. The central wavelength is 550 nm. The palm image is taken at 69 spectral band at length of 10 nm with spectral at 420-1100 nm. The database collected from 190 individual in between the age group of 20 to 60 year old. The database is collected in two session with average time gap at 1 month. The seven image is taken of each left and right palm of each person so total database contain 5240 images. The first ten and last ten spectra are removed because of low quality. The size of each image is 128*128 Pixel [10, 11, 12].

4) Multispectral palmprint Database

Zhang et. al., [13] they developed the multispectral palmprint database from the 250 different people in that 195 males are included. The database is collected with the help of data acquisition device which is the touchless palmprint device. The database is collected from 20 to 60 years old. The data is collected in two different session with time interval of 9 days. On each collection session the six samples of each palm is taken. From the total 500 different palm total 6000 images are collected in the database. Each time device collected the four different band (Red, Green, Blue, NIR) it means four images each time in 1 sec. The resolution of each image is 352*288 pixel.

5) Hyperspectral database

Zhao et. al., [14, 15] developed their own huge database of hyperspectral imaging device in visible light and NIR in the University of Macau, china. There is 209 subjects are taken to establish a dataset. In the spectral device the light source covers a spectral wavelength from 520 nm to 1040 nm with 10 nm intervals so total 53 spectral bands are used. The size of each image captured is 501*501 at 96 dpi. This images are stored in bitmap (*bmp) with 8 bit per pixel format. And five samples were collected from the each palm it means total 55,385 image dataset is collected.

6) The polyU palmprint Database (version 2)

The polyU palmprint database is collected from the 193 people from the total 386 palm. The Samples were collected in the two sessions. The average time between two sessions is two months. In each session 10 samples are collected from each hand but in the second session not all 10 samples are collected from each palm only few samples are captured. In this database total 7752 palmprint images were captured and large dataset is collected. Where in the second session only few samples were collected for evaluation of that total collected database, they choose 3740 image sample of 187 subjects in that each individual person give 10 sample at each right and left palm [16].

7) CASIA polyU palmprint

The Chinese academy of science developed the palmprint database with their self-developed palmprint recognition device. In the database the images were captured using the CMOS camera which is mounted on the top. In this device person have to just insert palm into the device and place it on to a uniform-coloured background. The database is developed from the 312 people with 16 samples from both right and left hand. Contain total 5502 palmprint images. All the images are 8-bit grey level in the JPEG format [17, 18].

8) COEP

The COEP devolved the palmprint database in the project funded by the Rajiv Gandhi Science and Technology commission. The database consists of total 1344 images collected from the 168 people. The images are captured using digital camera 8 samples at each subject. The resolution of the images is 1600*1200. The database collected in period of 1 year. The images are available in .jpg format [19].

9) XJTU palmprint database

The XJTU palmprint database is captured in an unrestricted environment. XJTU database is collected from iPhone 6S, HUAWEI mate8, LG G4, Samsung Galaxy Note5 and MI8. The database is collected in two environments with natural indoor light and flashing light from mobile phones. From 100 people in the age group of 19 to 35 years, the samples of each person give 10 to 15 samples of the left and right hands in different environments. The poses and background of the picture are always changing. The pixel size and image size of each mobile phone is different. A total of 20,000 images are captured. (100*2*10*5*2) [20].

Literature Review. Shashi Balaa, et. al., [21] the proposed method of palm print detection is strengthened applied on CASIA database in this study by the use of the Maximum Curvature approach and the Repeated Line Tracking method to identify broken and repeated lines. In this method, CLAHE is used to improve contrast, and a thresholding scheme is used to apply segmentation. The approach also employs a Log Gabor filter to effectively remove noise. The technique employs the greatest curvature method, which is quite useful for obtaining fine information from the palm. The method of repeated line tracking has a faster response time. In this procedure, a 100 percent matching score is achieved.

Mustafa s. Kadhm et. al., [17] they proposed methods for extracting characteristics and classifying them based on direction, Local Binary Pattern (LBP) features, C5.0, and K-Nearest Neighbour (KNN). The system used two palmprint image datasets from the College of Engineering Pune (COEP) and the Chinese Academy of Sciences (CASIA) and achieved a high recognition rate of 99.7% with a low error rate of 0.009%.

Zohaib Khan, et. al., [22] Contour Code, a unique multidirectional representation and binary hash table encoding for robust and efficient multispectral palmprint detection, was introduced in this study. For the extraction of a region of interest from palm images collected using noncontact sensors, an automatic technique was developed. They report quantitative ROI extraction findings by comparing automatically derived ROIs to humanly extracted ground truth, unlike existing approaches. In numerous experimental configurations employing two standard databases, PolyU and CASIA, the Contour Code consistently outperformed existing state-of-the-art procedures and consistently outperformed existing state-of-the-art techniques. The Contour Code's binary encoding in a hash table allows for simultaneous database matching and score level fusion of the multispectral bands in a single step. Score normalization is not required before fusion, unlike other methods. The Contour Code is a generic orientation code for line-like features that can be applied to fingerprints and finger-knuckle prints, among other biometric attributes. On both datasets, the error rates produced by their technique 0.003 percent on PolyU and 0.2 percent on CASIA are the lowest in the literature.

Hui Li et. al., [23] in the three stages of palmprint recognition in this paper, four different quantum algorithms are used. In palmprint filtering processing, the quantum adaptive median filtering algorithm is introduced first. Through comparison, the quantum filtering algorithm can achieve a superior filtering result than the classical algorithm. Due to quantum parallelism, the quantum Fourier transform (QFT) is then employed to extract pattern features with only one operation. In the feature extraction, the suggested technique outperforms the discrete Fourier transform by an exponential factor. Finally, palmprint matching employs quantum set operations and the Grover method. The quantum approach only needs to use square of N operations to discover the target palmprint, according to the experimental results, whereas the regular method requires N times of calculation. At the same time, the quantum algorithm's matching accuracy is nearly 100 percent. Experimental results show that the quantum algorithm only needs to do square of N operations to discover the target palmprint, whereas the classical method requires N times of calculation. At the same time, the quantum algorithm's matching accuracy is nearly 100%.

Junwen Sun et. al., [24] in this study, a band selection strategy on PolyU hyperspectral palmprint database is proposed. Low-quality bands are eliminated directly using picture entropy and the EER metric. After that, a clustering method is utilized to choose the best band combination, and the clustering method is finally validated by the band fusion method. The EER on the proposed approach is EER 0.17325%. Furthermore, in this study they told the biometrics system should have an only a high recognition rate as well as be resistant to spoof assaults. Hyperspectral images can provide a lot of information about a real human hand, rather than a printed palmprint paper or a rubber hand.

Akila P, et. al., [16] the left and right palmprint samples of the identical subject are shown to be substantially comparable in this paper. They proposed the methods on two databases Poly U (version 2) and IITD palmprint database. This research investigates the usage of this type of similarity for palmprint identification performance improvement. The proposed method thoroughly considers the characteristics of the left and right palmprint before designing an algorithm to compare their similarity. Furthermore, the suggested weighted fusion approach use this Similarity to merge the three types of scores derived from the left and right palmprint pictures. Extensive tests show that the proposed framework achieves very high accuracy, and that using the similarity score between the left and right palmprints improves accuracy significantly. The result of proposed method on polyU database is 0.06% to 0.2% which is less than conventional fusion method.

Wei Nie, et. al., [15] in this work by modifying image acutance, this research proposes a method for improving hyperspectral hand recognition. For the first time, a thresholded pixel-wise acutance value (TPAV) was developed for analyzing image acutance. Then, using Gaussian filters, image convolution was used to modify the picture acutance, which served as a pre-processing step for discriminative local feature extraction. Finally, using TPAV, the ideal acutance range for each band in a hyperspectral hand database may be calculated. Experiments on HDHV and HPV databases were carried very extensively. The findings backed up the theory that there is an optimal acutance range for hyperspectral hand biometrics to work at their best. The PolyU multispectral palmprint database was used to test the generalization capabilities of their method and supported the hypothesis. Even though acutance correction takes on average 0.0229 seconds for a single image from the three datasets the end result is much better than the original with no acutance adjustment.

Jinyu Guo, et. al., [25] they present a unique palmprint identification on the polyU (version 1) palmprint database they approach that combines phase congruency (PC) with two-dimensional principal component analysis (2DPCA) in this study. Extensive tests have been carried out to assess the algorithm's performance. They demonstrate that the phase congruency image can eliminate the effects of lighting conditions. Simultaneously, increase the recognition validity using 2DPCA, which does not damage the image structure. When the dimension is set to 46, the proposed technique gets a recognition rate of 99.44 percent matching time is 0.311s. The performance of the PCA, 2DPCA, MPCA, ICA, MICA, and LPP techniques is much superior. The fusion scheme, on the other hand, places a significant computational burden on the system.

Sen Lin, et. al., [26] they suggested a palmprint recognition method based on block mean gray values in this work, which they dubbed the non-contact palmprint identification simulation system. The simulation system described in this article provides a number of advantages over previous approaches, including ease of image acquisition, ease of operation, and high speed of operation. To test the method, they created their own non-contact palmprint database which contain 100 right palm with 10 samples each in that 5 samples for registration 5 for test. The results of the experiments reveal that this technology can achieve a decent palmprint recognition effect, and that it is simple, feasible, and successful, with a wide range of applications. This experiment has a 97.48 percent recognition rate.

Shuping Zhao et al. [14] they introduced a multiple features fusion representation approach for hyperspectral palmprint recognition at the score level in this paper. In that they create their own hyperspectral dataset of 55,385 images. In the first phase, they used LBP, LDP, and DCNN to extract features from hyperspectral palmprint images from a single person using all bands, resulting in three feature matrices comprising local texture features, local direction features, and global deep convolutional features, respectively. The 2D-PCA was then used to reduce the dimensionality of the feature matrices and generate a uniform feature vector. Finally, they suggested that collaborative residual feature fusion be used in recognition. The feature matrix's dimensionality was lowered with this new format. Then, using a dataset of 53 spectral bands, recognition experiments were carried out. When compared to feature combinations, the suggested feature representation approach had the best results, with an EER of 0.11 percent and an accuracy of 99.76 percent.

Anita G. Khandizod et. al., [27] in this paper, 13 image enhancement techniques were used to improve the quality of a hyperspectral palmprint image. These methods applied on PolyU Hyperspectral palmprint database. To determine the quality, subjective and objective image quality measures were used. Because subjective analysis can't be relied on because it varies from person to person based on their image perception and visual assessments, as well as being time consuming, the enhanced image was subjected to objective quality measures such as MSE and PSNR. According to their findings, the 2D median filter is the best image enhancing strategy for hyperspectral palmprint images when compared to the other techniques.

Anita Gautam Khandizod et. al., [12] in this research, palmprint line features are recovered using the phase congruency approach on a total of 600 palmprint images, and limited adaptive histogram equalization (CLAHE) is utilized to increase image quality and contrast. The phase congruency feature vector is compared to other database feature vectors using a k-NN classifier, and the system determines how many people are admitted and denied. The experimental results reveal that as the database recognition accuracy improved, so did the database recognition accuracy. The proposed method obtains a recognition accuracy of 95.31 percent.

Ajay Kumar et. al., [28] in this study, they looked at how to improve performance by combining numerous palmprint matchers at the rank level. They looked at rank level combination for palmprint matchers utilizing four distinct ways, including Borda count, weighted Borda count, highest and product of ranks, and Bucklin majority voting, as well as proposing a new nonlinear approach for combining the ranks. The experimental results are shown on two palmprint databases, from 234 and 100 participants palmprint image databases, and they consistently show that rank level combination can be used to increase performance from a combination of matchers. Second, as demonstrated by the experimental result of 98.75%, their suggested nonlinear rank level fusion approach consistently outperforms existing popular rank level fusion approaches.

Xingpeng Xu et. al., [29] to the best of their knowledge, a quaternion model is used for multispectral biometrics for the first time in this study to completely exploit the information in multispectral palmprint images. QPCA is designed to represent global features, while QDWT is intended to extract local characteristics. For 500 palms, their fusion could obtain a recognition accuracy of 98.83 percent. The experimental results suggest that the proposed method is suitable for real-world applications, and that the quaternion model is a useful and efficient multispectral biometric tool. In the case of less than four illuminations, the quaternion matrix has been demonstrated to be still effective for multispectral palm print.

Huikai Shao et. al., [20] they undertake a thorough investigation for efficient deep palmprint identification using distilled hashing coding in this paper. Using five mobile phones, they created an unconstrained palmprint image database. This database has more palmprint photos and modalities with less acquisition constraints than comparable public databases. Each image has 14 important locations specifically annotated for ROI extraction, which will be made public to the scientific community. They were able to identify important spots and generate relatively consistent ROIs using the regression tree approach. They achieved efficient palmprint verification and identification using a deep hashing network, with an average accuracy of 97.49 percent and an average EER of 0.607 percent. On light networks, the knowledge distillation technique is utilized to improve recognition performance. The average classification accuracy has increased by 40.61 percent, while the average EER has decreased by 1.64 percent, according to the findings. The results of the experiments suggest that the database they created has a number of advantages and may be utilized successfully in the research of a variety of tasks.

Dexing Zhong et. al., [30] in this study, they proposed a palmprint recognition method based on a Siamese network that can calculate the similarity index of two input palmprints directly. Their technology also included end-to-end recognition. Two parameter-sharing VGG-16 networks were used to extract the convolutional characteristics of two input palmprints, with the top network identifying the similarity of two input palmprint based on their convolutional features. This method had an EER of 0.2819 percent on the PolyU test set. In addition, using their realistic dataset XJTU, the EER was 4.559 percent.

Midhuna Naveen et. al., [31] in this study, they concentrated on palmprint identification utilizing deep learning methodology; deep learning is the most powerful technology, and RFCNN has effectively applied it to biometric and computer vision problems. The palmprint recognition system based on RFCNN offers a high level of accuracy when compared to existing identification systems and is expected to bring in a new age in biometric identification technologies. When compared to other CNN algorithms, RFCN has the highest accuracy of 98.36%. Alex Net has a 98.21 percent accuracy, 92.56 percent LBP, and 89.50 percent SVM. The accuracy of SVM is the lowest. The accuracy rate is increased by combining CNN-based algorithms. The greater the accuracy and test data rate, the larger the dataset utilized to train the model.

Xueqiu Dong et. al., [32] they propose a palmprint recognition algorithm based on Convolutional Neural Networks (CNN), a palmprint recognition method that can directly act on grayscale images, the proposed approach is applied on the palmprint database of

Hong Kong University of science and technology the ability to learn palmprint database and get palmprint features using network automatic feature extraction, and the network can adapt to the diversity of palmprint through the design of training data. The palmprint feature can be recovered from the palmprint original without image pre-processing or other special extraction through effective network and training data design, resulting in effective identification. The results of the experiments reveal that the method is effective and trustworthy in recognizing palmprint, with an accuracy of 99.95 percent.

Abdallah Meraoumia et. al., [33] proposed the design and development of multiple multimodal biometric systems for person identification that make use of features retrieved from a variety of palmprint image representations. They employed two methods for feature extraction: the method of feature extraction vector and the method of features model. The trial findings on a database of 400 users reveal that the identification accuracy is very high. They employ multiple common databases from PolyU to evaluate the proposed systems' identification accuracy. The databases include palm pictures with various representations, PLP, PVP, CLP, MSP, and 3DP. They employed their approach to generate a fused matching score that was used in the recognition step. The ROR for the hybrid system was 100%.

Anita G. Khandizod et. al., [34] in this paper, they used the Polytechnique Hong Kong University database of multispectral palmprint images, which has 6000 samples with four distinct illuminations, for a total of 24000 images. However, they only used two samples from each session, total 800 images. In that study, they first proposed database pre-processing, in which the Gaussian filter provided the best results, and then they did image fusion of all four illuminations using the DWT technique to decrease the large dimensionality 2nd order derivative. The Euclidian distance of two image was then determined. When the threshold value is 0.33 percent, it yields a recognition rate of 90%.

Poonam Pooniaa, et. al., [35] in this paper, they proposed a new palmprint template based on three standard databases and a multispectral palmprint database. They performed Delaunay triangulation on that database, which is mathematically proven to produce a robust local distribution, and the proposed template uses the minutiae transform algorithm to generate minutiae triplets. After that, the proposed template is resistant to the reconstruction procedure, and it is rotation, translation, and distortion invariant throughout. The recognition rate on the CRR and EER is 95.4 percent and 0.37 percent, respectively. PolyU has a 0.39 percent recognition rate while IIT Delhi has a 0.4 percent recognition rate.

In this survey of all research papers various feature extraction and classification methods on the palmprint database were used. Maximum curvature, repeated line tracking, KNN (K-Nearest Neighbour), Quantum algorithm, Deep convolution neural network, CLAHE, Contour Code, quantum Fourier transform (QFT): this method was shown to be the most accurate and fastest. Resistance against spoof assault is just as vital as accuracy and quickness. There are two types of imaging that achieved the best results in the research survey: hyperspectral and multispectral images. While multispectral images can be readily spoof, hyperspectral images are very difficult to spoof.

Hyperspectral Image. Hyperspectral imaging is another name for imaging spectroscopy [36]. Instead of assigning main colours (red, green, and blue) to each pixel, hyperspectral imaging analyses a wide spectrum of light [37]. In the wavelength range of 500 to 2500 nm, hyperspectral sensors acquire more than 100 contiguous spectral bands with a narrow bandwidth (5–10 nm) [38]. Hyperspectral sensors are designed to collect data from the reflecting region of the electromagnetic spectrum. The entire inspection spectrum is organized into hundreds of discrete contiguous bands and runs from visible to near infrared. Hyperspectral imaging is a popular remote sensing technique [39]. Hyperspectral images gather more spectral information, reducing processing time and speeding up the process. Hyperspectral bands have a 0.01m gap between them. Data for hyperspectral imaging is collected in three dimensions: two spatial and one spectral [40]. The resulting hyperspectral images not only contain a lot of spectral information about the ground features' unique physical attributes, but they also have a lot of spatial information about them. As a result, Hyperspectral can be used to tackle problems that are difficult to answer in multispectral or natural photos, such as pixel identification [41].

Multispectral Image. Multispectral images are becoming increasingly common in research domains such as remote sensing, fluorescence microscopy, astronomical imaging, and geo-tracking [42]. A multispectral image is grey scale image. A grayscale image has one wavelength or colour channel, a Red–Green–Blue image has three wavelengths for each pixel, and CYMK has four colour channels. Multispectral imaging has between four and twenty colour channels [43]. Image data is captured via multispectral imaging in specified wavelength ranges across the electromagnetic spectrum. The wavelengths can be separated using filters or detected using devices that are sensitive to certain wavelengths, such as light from outside the visible light spectrum, such as infrared and ultraviolet light. Spectral imaging can extract information that the human eye's visible receptors for red, green, and blue are unable to acquire [44]. Using multispectral illuminators based on electromagnetic theory, multispectral images are produced. In order to make a better choice, multispectral approaches necessitate many samples of the same item. Multispectral images avoid the RGB image's metamerism problem while also providing more information than just colour and increasing colour accuracy. It makes use of a variety of electromagnetic spectrums in the visual range.460nm, 630nm, 700nm, 850nm, 940nm, and white light are the wavelengths of the illuminator that correspond to the six spectrums [45].

Conclusion. The Biometric based on palmprint identification has improved day by day. In this paper we reviewed the palmprint available databases. We have studied the database how it was created with which devices and in which environment, database size, format and type, the database was created with contact based or contact-less device. In all the study we have reviewed the methods and different techniques applied on the available database and their recognition rate and speed. There are two types of imaging that achieved the best results in the research survey: hyperspectral and multispectral images. While multispectral images can be readily spoof, hyperspectral images are very difficult to spoof.

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