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BIOMETRIC RECOGNITION OF HUMANS USING SCANNED IMAGES OF THE RETINAL PART OF THE EYE

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Abstract

Biometrics finds a lot of application in the modern day security aspects whether it may be in industrial sector, defense sector or in domestic sectors. In this world, without biometrics, it is very very difficult to incorporate the security measures in any organization. Hence, personal identification can be very important problem in any bio-metric recognition scenarios. Entry of a person into an organization in the work environment plays a very important role as unauthorized persons if entered into a premises may create a flutter & inviable to some terrorist attacks. Hence, biometrics of an authorized person into the work environment plays a very im-portant role. Quite a no. of bio-metric methods exists for identification purposes, viz., physiological & behavioural. Some of them are hand, iris, voice, finger-print, human face, ear, gait/gesture, posture, thumb, ear, vien, code, password, signature, pattern, palm print, etc.. As quite a substantial no. of biometric methods for detecting the human beings exists by automatic means, retina scan is being considered as the biometric identity in the research work undertaken by us because of a large number of advantages over the other biometric identities. For biometric recognition of a person using retina scans, a number of methods exists in the literature. In this context, fractal dimension method is one of the method that could be used. Hence, the retinal recognition is performed in our proposed work for identifying the person by developing new approaches using Fractal Dimension methodologies. In this paper, 100s of papers are being surveyed upon the chosen research topic and a brief survey of the existing methodologies that are used for the biometric recognition of personnels using the human being's retina is being presented. In fact, this paper is a collection of the works done by various authors in the relevant field till date. This survey paper aims at providing a basic information about the on-going current works & the completed works in the field of biometric recognition using the retina so that the paper give a base for the oth-er researchers to start the their work.

Keywords - *Biometrics, Retina Scan, Physiological, Behavioural, Matlab, Simulation, Security, Eyes, Fractal Dimension, Pre-processing, Segmen-tation, Feature Extraction, Nerve Fibres, Enhancement, Computations.*

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1. Introduction

Paper presentation in this research article is as follows one by one. A brief introduction into the research topic is pre-sented in section II. The Retinal Recognition System (RRS) is briefly described in section III followed by the different methods that are used for the recognition process in section IV. A brief review of the literature survey is given in section V, next it is followed by the advantages & future scope in section VI. The paper finally concludes with the conclusions in section VII followed by a large number of references till date.

2. Introduction

Bio-metrics is the craft of distinguishing an individual by various techniques. Distinguishing or confirming ones recognition utilizing bio-metrics is pulling in impressive consideration in this cutting edge computerized world, one the primary reason being the security issues in different exceedingly delicate spots (defense areas). It is the won-derful investigation of programmed ID of people that uti-lizes the one of a kind physical or conduct attrib-utes/qualities of people to remember them. Since biomet-rics is to a great degree hard to manufacture and can't be overlooked or stolen, biometric confirmation offers a help-ful, precise, vital and high secure option for a person, which has a colossal preferences over the customary cryp-tography-based verification plans.

In the present biometric insights innovation, security for bio-metric system frameworks is transforming into pro-gressively more fundamental needs of the societal work areas. The scope of structures which have been imperiled is regularly expanding and recognition assumes an essen-tial job as a first line of resistance against gate-crashers. Cutting edge e-security concepts are in basic need of find-ing precise, agreeable and practical options in contrast to passwords and individual personality numbers as budget-ary misfortunes increment significantly year over year from PC-based misrepresentation including PC hacking and character robberies. Biometric answer the arrangement with those key inconveniences, in light of the fact that a person’s bio-metric insights specific and can’t be ex-changed.

Bio-metrics, alternatively, presents a secure approach of authentication and identity, as they’re hard to duplicate and use it by someone else other than the owner of the bi-ometric. If biometrics is used together with something you recognize, then this achieves what is called two-factor au-thentication. Two-point authentication is an awful lot & has more potential as it requires both additives capturing & identification. Personal identification, recognition is a vital problem in any biometric application.

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Fig. 1 : Types of biometrics (physiological & behavioural)

Fig. 2 : Biometric device - Retina scan machine

Bio-metrics can be classified on the basis of behavioral or the physiological attributes of human beings. A typical physiological trademark is a moderately steady physical feature of humans, such as DNA, password, hand, finger-print, palm, signature, facial features, retina patterns or an iris patterns & the respective photographic representation of the same is shown in the Fig. 1. Note that physical properties are the one which are examined by using the body shape. A typical behavioral characteristic is a person's voice or a key-board typing pattern or a voice, identity-card, RFID tag, Bar code, QR code, audio or a speech pattern of a human being & the respective photographic representation of the same is also shown in the Fig. 1. Note that the behavioural traits are examined using the information of how a person behaves which may include how the person makes his/her signatures, voice of a person and dynamics of keystroke.

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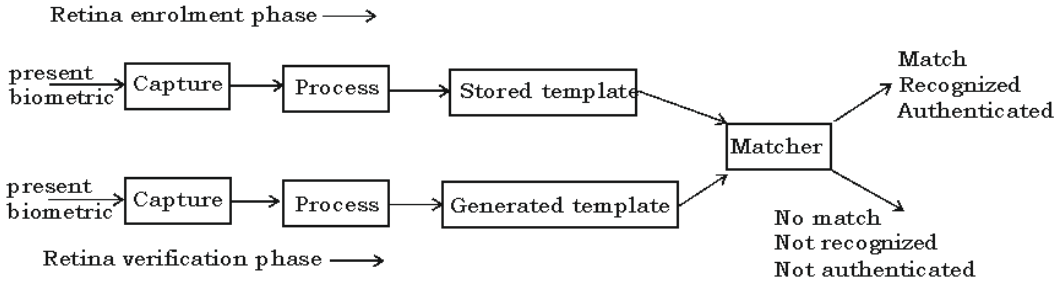

Fig. 3 : The Block-diagram of a typical retinal biometric scheme for the recognition purposes of human beings

A typical biometric system consists of 3 important parts, viz., capturing phase (image acquisition), processing phase, identification & classification phase, of course, it can operate in different phases also. Bio-metric acknowledgment requires contrasting an enlisted/registered or selected biometric test (biometric layout or identifier-DB) against a recently taken biometric test using a high profile cam. (for ex., a retina scan image of a human being) as shown in the Fig. 3. Amid enrolment as appeared in the Figure No. 2, an example of the biometric quality is caught, prepared by a PC, and put away for later examination, which is nothing but a template matching technique or a pattern recognition technique that could be used in image processing or computer vision.

Biometric acknowledgment can be utilized in distinguishing proof mode, where the biometric framework/system recognizes a man from the whole enlisted populace via scanning a database for a match dependent on the biometric.

For instance, a whole database can be sought to confirm a man has not connected for privilege benefits under two distinct names. This is sometimes called “one-to-many” matching and the concept of how the biometric identity is recognized from a database is shown pictorially in the Fig. No. 3. A bio-metric system/framework can likewise be utilized in the check/identification mode (Fig No. 2), where the biometric framework verifies a man's asserted personality from their recently selected example or a pattern stored in the PC's memory. In most PC access or system get to situations, confirmation mode would be utilized. A client enters a record, client name, or embeds a token, for example, a shrewd card, yet as opposed to entering a secret key, a basic touch with a finger or a look at a camera is sufficient to validate the client.

In this context, after studying the advantages & drawbacks of all the biometric methods, the retina of the human eye was being selected for biometric recognition of a human being in this proposed work as it a complex one. The retinal recognition is going to be performed for identifying the person using the concept of Fractal Dimension in our research work as quite a no. of uses are there especially in the medical imaging field that too in the secured areas. Till date, the bio-metric recognition using retina scan has achieved significant prominence in the security world over all the other methods because of its uniqueness, non-invasiveness, secured approach of recognition with unique identification, no stealing and stability of the human retinal patterns as it is specific to one person only & is presented in the Fig. No. 2.

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3 Retinal Recognition System

In the section, the structure of the retinal recognition system is being presented in a nutshell. The structure of human eye is shown in the Fig. 4 along with the retinal parts, which is our Region of Interest (ROI). The defensive external layer of the eye is called as sclera. Alternate parts of the eye are cornea, focal point's lens area, retina & the iris. The retina is the light delicate tissue which frames the internal side of eye (rear end of the eye). The optical components of the eye center the picture onto the retina, along these lines starting a progression of compound and electrical occasions inside the retina. Nerve Fibers (RNF) inside the retina send electrical signs to the mind, which at that point translates these signs as visual pictures. Retina is roughly 0.5 mm thick & spreads the inward side at the rear end of the eye, where the images are also formed. A number of blood vessels (BV) are present all over the eyes to provide nutrition to various parts of the eye. The mean dia of the retinal blood vessel is ±250 μm & the retina connects all the optic nerves to the brain.

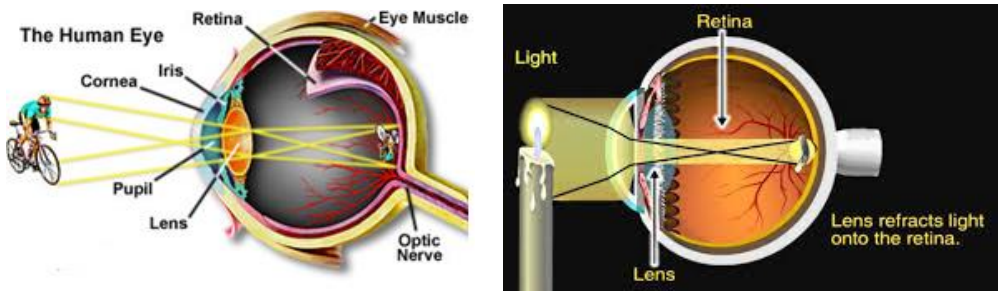

Fig. 4 : A front view of the human retina along with its different parts

Retina recognition is a method of biometric identification and authentication that uses mathematical sample-recognition strategies on images of one or each of the retina of a man or woman's eyes. Retinal scanners are regularly utilized for verification and recognizable proof purposes. Retinal filtering has been used by a few government offices including the CIA, NASA, ISRO, DRDO, FBI & the CIA. Notwithstanding, lately, retinal checking has turned out to be all the more economically prominent.

The retina scan technology works on the following concept as explained in the following paragraphs. The scanning of the retina is performed by coordinating a light emission low vitality infrared light to the eye using a fundus retinal camera of the individual when he/she glances through the eyepiece of the scanner, as one glances through a magnifying instrument as appeared in the Fig. No. 4. That beam of light draws an institutionalized course on the retina. As the veins of the retina retain more light than whatever is left of the eye, the measure of reflected light changes amid examination of the scanning process.

A retinal scanned output is a bio-metric procedure that utilizes the interesting examples on a man's retina veins. The subsequent example of varieties is changed over to a PC code and put away in a database. A run of the mill retina acknowledgment framework comprises of mostly 3 fundamental modules. They are picture procurement, pre-handling stage and additionally highlight extraction and encoding as appeared in the Fig. No. 2.

The retina biometric template is typically created using a few type of mathematical operations and techniques. If a character desires to be recognized by using the system, then

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first a digitized photo of their eye is produced, after which a biometric template is created for his or her retina area. This biometric template is compared with all the other pre-existing templates inside the database using certain positive matching algorithms that allows to get the identification of the person.

The retinal scanned output maps the remarkable examples of a man's retina, which has veins that will assimilate light more promptly than the encompassing tissue and are effortlessly related to proper lighting. The primary rule behind retinal checking innovation is that the veins at the retina give a one of a kind example, which might be utilized as biometric identifier. The infrared vitality is assimilated quicker by veins present inside the retina than by encompassing tissue; it is accustomed to lighting up the eye retina. Retinal vein design is extraordinary compared to other biometric trademark in high security conditions. It is an exceptionally steady example after some time and autonomous of hereditary variables and furthermore one of the hardest biometric to manufacture as the ID depends on the blood course along the blood vessels of the retina.

4 Methods used for retinal recognition

In biometric recognition using retina scans, the retina scan recognition system has got 2 levels (arms), viz., the registration arm : the retina enrolment section and the verification arm : the retina recognition phase. Note that in both the above mentioned 2 cases, viz., the registration arm and the verification arm, the template of the retina scan image to be verified is compared with the set of retina scan templates in different angles which are stored in the retina databases. In general, the retinal scan recognition system could be summarized as consisting of different blocks with each block having its own functionality & all the blocks are going to be used in our research work, they are … the database, image acquisition, recognition, gray scale conversion, pre-processing, re-sizing, boundary detection, segmentation, localization, normalization, enhancement, feature processing, feature extraction, feature encoding, matching, classifiers, testing, decision taking, authentication, identification & recognition.

Retinal bio-metrics is one of the precise biometric procedures utilized for individual ID in the modern days in this digital technological world. Generally, 3 techniques which are considered for retinal distinguishing proof process are the

- Fractal Dimension (FD) Method,
- MS – Morphological Segmentation and the
- BPM - Branching Points Method.

The pre-processing techniques for all the 3 retinal identification processes remains the same [35]. The input retinal fundus image is resized for maintain uniform size of the image which is very useful in processing, then the image of retina is converted to GS for the simplicity of computation and the contrast of the image is enhanced to effectively differentiate the foreground blood vessel pattern from the background. In our research work, the FD method is going to be used as it is a very popular method compared to the others. A small overview of the Fractal Dimension follows.

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Fractal Dimension Method (FD) - Fractal dimension method for retinal identification computes the fractal dimension of the blood vessel image which is extracted from the retinal fundus image. It is a statistical quantity that gives the indication of how completely the fractal appears as it is zoomed down to finer scales. It will measure the irregularity over multiple scales. It can be computed by many methods such as Fractional Brownian Motion, Hausdroff Besicovitch dimension, etc… but they are complicated algorithms. The box counting algorithm is relatively simple method for calculating fractal dimension which divides the image into smaller blocks to gather the data. The image is essentially covered by an image grid and the boxes in which image information is present is counted and plotted versus magnification, the slope of the line fitted by these points on a plane gives the fractal dimension. A database is created which contains the value of fractal dimension for the trained retinal images.

Many people have worked on the development of the FD concepts. Here, follows a brief description about the development of the fractal dimension techniques. Benoit B. Mandelbrot, the father of FD methodology has acquainted the hypothesis of fractals in order to explain how much complex the natural objects are [1]. He worked for IBM Corporation in 1980s & developed a correlation between fractals and nature through his invention along with his teammates. Mandelbrot proved that several fractals existed in natural world and that fractals were precisely the replica of certain phenomena & also established new categories of fractals to represent further complex structures like cloud and galaxy.

By promoting the thought of a fractional dimension, Mandelbrot defined the term ‘fractal’. His work has inspired a lot of interest and has made fractals an incredibly important area of research. He described a fractal as a rough or irregular geometric shape that can be further divided into similar several sub parts, each of which is (at least approximately) a smaller sized replica of the whole object. The majority of fractals or natural objects have unlimited complexity and details. Also, the majority of fractal objects or natural objects have fractional dimensions.

With the aid of fractals, one can model natural world very well. Fractals can be employed to create realistic sunset or sunrise, wireframes of mountains, trees, clouds, ripples on lakes, coastline, seafloor galaxy, plants, ionosphere layers etc. Various types of fractals exist in practice. A lot of popular theories and pioneering applications for fractals are being developed. For example, fractals have been useful in areas like image compression, decompression, in the generation of music from pink noise, in the analysis of high altitude earth quake and lightening phenomena.

The fractal dimension as discussed in the previous paragraphs could be used for biometric retinal identification in the areas where security is of a prime concern & is explained in the next few paragraphs. The retinal blood flow in people is factually self-comparable and fractal. The fractal measurement of the vascular structure removed from retinal picture is distinctive for various people. This empowers the utilization of fractal measurement for individual recognizable proof process.

Fractal examination has been broadly embraced in an assortment of logical zones in the field of restorative picture preparing. The Fractal Dimension (FD) portrays the data about the geometric structures of the characteristic items [2]. A few regular articles show self-

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comparability property over a scope of scales enabling them to be represented by a FD [3]. As therapeutic pictures are mind boggling in nature and show different self-closeness properties in various scales, FD has been embraced to extricate different highlights [4]. Likewise, the Fractal measurement assumes a key job in a few zones of therapeutic research, for example, recognizing influenced tissues from solid tissues.

Ongoing advancement in the investigation of fractal hypothesis proposes some alluring answers for identifying and diagnosing a few maladies through fractal measurement systems [5]. It is likewise been viably embraced in separating the basic changes in bosom malignant growth and cerebrum pictures [6]. The way that fractal measurement is uncaring to picture scaling has roused us to apply the idea of fractal measurement for the investigation of fundus retinal pictures (RI). It is likewise seen that fractal measurement demonstrated a solid connection with harshness of surface [7]. Furthermore, fractal measurement has been demonstrated as an amazing apparatus for quantitative characterization of uproarious medicinal pictures whose edges are for the most part not clear [8].

Fractal geometry has acquired an essential place in the field of science and innovation [9]. Fractals are self-comparable protests and have structure at all scales which portray the extraordinary geometrical highlights of occasions and questions happening in nature. The field is very broad with numerous applications like measurable investigation, normal displaying, pressure procedures and PC designs [10].

There are different types of fractal dimension methods, viz., Box Counting, Hausdroff, Differential box counting. The Blanket Fractal Dimension, Perimeter fractal dimension, Area / perimeter relation, Semi-variance fractal dimension, Power spectrum method, Perimeter area relationship, Higuchi fractal dimension. In our research work, we are planning to use some hybrid combination of the methods so that it may give effective results.

Even though, there are quite a number of biometric techniques as mentioned previously, the retina is considered as the efficient method as it the retinal part is at the rear end of the human eye, it is non-contact and unique for a particular person. On the contrary, retina recognition in the recent days is also playing a very important role in biometric authentication / recognition of human beings. The main advantages of the retina recognition systems are as follows. Retinal scanners have several advantages over finger printing and voice recognition systems. They do not require as much computer memory as a finger print scan, and they are not subject to contamination from dirt or finger misplacement.

Not at all like voice acknowledgment, a retinal scanner utilizes infrared light to delineate. As a man investigates the eye-piece, an imperceptible light emission vitality infrared light follows a roundabout way on the retina at the back of the eye (Fig. 4). The blood-filled vessels ingest a greater amount of the infrared light than the encompassing tissue. Along these lines, there is a variety in the power of the reflection. The scanner estimates this reflection at 320 along the bar way. It at that point allocates a force review somewhere in the range of zero and 4,095. The subsequent numbers are packed into a 80-byte PC code. This code would then be able to be contrasted and designs that have just been gone into the PC's information base.

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The retinal vein design does not or once in a while changes amid a man's life and thus the retinal acknowledgment itself as an extremely compelling biometric quality contrasted with others. The retina is an inward organ which isn't influenced by external ecological changes. The span of the genuine retinal format is just as far as bytes which is little and involves less memory space and the preparing time required is less. Henceforth, distinguishing proof process requires less capacity for database contrasted with other biometric strategies and furthermore performs quicker.

The proficient calculations for retinal biometrics utilizing different methods which are precise and performs quicker are thought about utilizing execution parameters exactness and blunder rate. Any of these strategies can be utilized by considering prerequisites, for example, computational time, memory utilization, unpredictability and exactness required. In the recent digital era of the current central government policy, biometric has been made compulsory in all the places (for ex., Aadhar, finger print, iris, retina, signature, face & PAN). We had seen even though there were lot of biometric methodologies, each one was suffering from one or the other drawbacks.

Finally, in this context after studying the implications of each of the biometric methodologies, we arrived at the selection of the retina as one of the best method of biometric identification of human beings due to its large number of advantages mentioned above & also being non-invasive, not-contact ones. Also, due to the current initiative taken up by the central government in the field of biometrics in all sectors, this had further motivated us to take up the research work on the retina method of biometric recognition.

The main motivation being some of the digital initiatives taken up by the central & state governments in the wake of security issues in the country. This has made us to identify the problem. Henceforth in continuation, with being motivated from this type of research work after making a through survey, we planned to do some novel works relating to the biometric authentication / recognition using the retina scans as it is a non-contact one and that too the retina is situated at the rear end of the human eyes. Henceforth, the research was started upon to go through a large number of papers in this field and a survey paper was thought of to be done at the start of the research work. The survey was done by collecting the informations from various sources such as the internet, libraries of different colleges, universities, friend circles & from other fellow researchers.

5. Literature survey / Review

Many works have been proposed on retina biometric human recognition system for secure authentication till date. This section provides the knowledge about the existing technologies, its advantages and disadvantages, work done by other authors till date. Subsequent paragraphs explain how the researchers have contributed to the field of biometric recognition using retina scans. To start with, 100's of research papers were collected from various sources, studied @ length & breadth and its outcomes were studied, analyzed to start with and the outline for the survey or the review paper was given. The next subsequent paragraphs follows a brief review of the works by various authors.

Zahra Waheed & et.al. [11] devised a strategy for retinal recognition by extracting blood vessels from the retinal image. Retinal recognition mainly involved 3 steps, they are, pre-processing, segmentation and matching the blood vessel templates in their work. Seyed

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Mehdi Lajevardi et.al. [12] presented biometric graph matching (BGM) algorithm for retinal verification. The retina vascular structure was extricated utilizing morphological handling and coordinated channels in their research work.

A wavelet based energy methodology for recognition of the retinas was developed by Rita A. Vora & H.B. Kekre in [13]. To efficiently extract localized texture information in digital images, the wavelets are used in their work. Nazariy K. Shaydyuk and Timothy Cleland [14] proposed retina acknowledgment strategy with liveness identification utilizing dot differentiate imaging. To make the obtaining framework less defenseless to double dealing, there was an innate prerequisite for liveness location, which was the requirement in their exploration work.

S.S. Bisht, Annapurna Singh & Annapurna Singh [15] introduced relatively less complex and effective method for extracting blood vessels from retinal image which can be used for retina recognition by using Kirsch's templates, which gave satisfactory results. Zahra Waheed, Amna Waheed, M. Usman Akram [16] proposed a method for retina acknowledgment utilizing auxiliary highlights of retinal picture & their method involved vessel based matching by using feature vector points.

Akter Hussai et.al. developed biometric security application based on retinal vessel feature in their research work in [17]. A programmed strategy was connected to distinguish and recognize vascular branches and hybrid focuses in the retina zone. These were mapped from veins in the retinal picture. To acknowledge or dismiss a guaranteed personality from a man, the system was trained by models. Abu Hasnat & et.al. [18] proposed retinal recognition system based on fast normalized cross-correlation (NCC). This biometric scheme was based upon RGB retinal fundus images. The feature vector was of relatively smaller dimensions and produced better recognition that enabled to use this method for real-time (RT) applications.

In [24], Ungureanu *et.al*. chipped away at the individual distinguishing proof utilizing fractal investigation of retinal pictures and created great outcomes. In their work, a retina-based biometric includes the examination of the veins arranged at the back of the eye was considered. In this work, they introduced a technique, which utilized the fractal investigation to portray the retina pictures. The Fractal Dimension (FD) of retina vessels was estimated for various 20 pictures and afterward got for various estimations of FD for each picture. Their calculation gave a decent precision and was additionally simple to execute.

Fan Huang & their research team researched on the reliability of using retinal vascular fractal dimension as a biomarker and developed path breaking results. Modarresi *et.al.* worked on the retinal biometric recognition using shearlets transforms. Since the fundamental features of retinal images were comprised of different orders and locations, in their work, they attempted to analyze the retinal images by means of a multi-scale method, which is based on shearlets transform that is an effective directional multi-scale system for image assessment [25].

In [26], a brief introduction to how to evaluate the different types of biometric systems was presented by the team of researchers led by Phillips *et.al.*, where they presented a summary of the different technological schemes that could be applied for the biometric

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authentication process. This paper gave an insight into the advantages & the disadvantages of the iris recognition systems. In biometric authentication, FD scheme could be employed based on the correlation of the integrals on the streaming data. This concept was put forth by the team of researchers led by Wong *et.al.* in their contributory paper in [27].

The authors compared their proposed works with others & showed how fast they can estimate the fractals in the detection process. As the retinal image is made of high resolution pixels, sometime there would be a failure of the box-counting algorithm and in such cases it would become impracticable to apply it for the biometric recognition process of human beings. This concepts was put forth by the team of authors, Greenside *et.al.* in [28].

A brief review on the performance analysis of iris authentication system was presented by Reeta & Vandana in their survey paper in [29]. Retinal image could be considered as one of the most robust & accurate biometrics for recognition purposes. A new biometric recognition system based on combination of Fourier Transform (FT) & Wavelet Transform (WT) was developed by the group of authors led by Masoud Sabaghi in their research paper in [30]. They at first localized the OD using TM techniques and then used it to rotate the retinal images to some reference or standard position. Angular partitioning with the structure on magnitude spectrum of retinal images & WT was used for identifying the features. At the end, they used the Euclidean distance for matching the features. The work was applied of a standard database that was consisting of more than 400 images of the retina taken from 40 humans. All types of images was there in this database. They achieved a identification efficiency of more than 99 %.

A novel retinal identification bio-metric system was proposed by Farzin *et.al.* in [31]. Similarly, a wavelet based retinal recognition module was proposed by Shahnazi *et.al.* in [32]. Concepts of fuzzy was used by Tabatabaee *et.al.* in [33] to detect humans using retina. Ortega *et.al*. in [34] proposed some mixture of algos for biometric authentication. Morteza Modarresi in their research paper in [44] addressed the issue of using the Mahalanobis distance to assess the biometric pattern similarity & human identification is achievable though solving the maximization for the matching scores. The authors used the multi-resolution feature extraction technique to achieve their goal.

Work on the retina identification which was dependent on the blood vessel pattern using the concept of partitioning using radial & angular means was carried out by Amiri *et.al.* in [38]. They used 2 types of partitioning of the retinal blood vessels and used it for biometric recognition using the scanned retinal images. Ortega's research group worked on the verification of retina using the concept of feature points dependent on the biometric pattern and produced excellent results in [39] as they had used a hybrid concept of feature extraction & recognition.

An efficient retina pattern recognition algo for identifying the human beings was proposed by Islam, Siddiqui & Paul in their research article in [40]. Rotation in-variant retina recognition method which was based on the sketch of retinal blood vessels was developed by Barkhoda *et.al.* in [41]. The authors used the concept of angular partitioning for biometric recognition and produced fruitful results in comparision with the work done by others. Dehghani *et.al.* in [42] developed a retina identification protocol based on the rotation of the invariant moments.

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Biometric retinal ID robotized framework dependent on counterfeit neural systems (ANNs) was contacted upon by Mr. Selin Üzelaltinbulat in [43] in his proposition work. The structure of acknowledgment arrangement of retinal pictures was planned in their work. Preprocessing was connected to change the retina pictures to GS esteems and concentrate the I/p highlights from the retina pictures. These highlights were given as I/p signals for the Artificial Neural Networks. ANN was then connected to characterize the retina designs in an acknowledgment step utilizing an organized methodology and built up the learning calculations. The Back Propagation calculation was then connected to prepare neural systems to acquire an ideal biometric acknowledgment plot.

Cemal Köse & CevatİkiːBaş worked on the retinal bio-metric identification scheme in [45] & produced astonishing results. In their study, they propose a personal identification system which was based on retinal vasculatures network analysis in the fundus images of the human eyes. In order to accurately identify a person their approach first segments the vessel structure and then employs similarity measurement along with the tolerations.

In greater part of the work done by the different creators / specialists [1] – [50] presented in the previous paragraphs in this literature survey disadvantages. Some of the major drawbacks of pre-existing methods mentioned earlier were ….

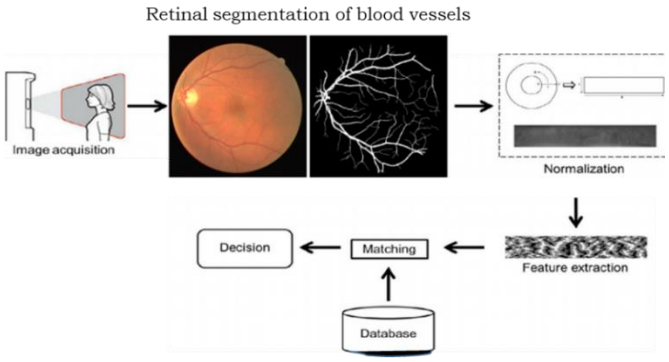

Fig. 5 : Block diagram of a typical retinal biometric scheme for the recognition purposes of human beings

- Few method fails when there is noise like reflection in the image & becomes sensitive to noise, thus it will produce complex or extra edges of images in the resulting image.
- Few works requires excessive computation to achieve high accuracies (*computationally quite expensive*).
- In some methods, longer execution time and large amount of storage is required to achieve secure authentication.
- No work is done on increasing the performance and accuracy of the existing system.
- False matches in the millions of retina scanned image comparisons were produced.
- The number of computations involved in the recognition process was very high.
- Many methods developed by the authors failed due to noise like mirrored image in the retina photographs & thus the performance index was not upto the mark.
- Full-fledged automation of the retina recognition system was not done, automatic GUI's were not developed.

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Some of the drawbacks [1] – [50] of the works that were carried out by the earlier researchers are going to be considered in our research work, will be studied in brief, problem statement is going to formulated or defined & new algorithms are going to be developed in order to overcome some of the drawbacks of the works done by the earlier researchers. The research work is going to be verified through effective simulation results in the Matlab-Simulink environment or may be in LabVIEW environment or any using any other tool by developing the codes in order to substantiate the research problem that is going to be undertaken by us in the near future.

6 Advantages & future scope

Retinal scanning finds a lot of advantages in the current digital scenario & has been used in prisons, for ATM identity verification and the prevention of welfare fraud. Retinal scanning also has medical applications. Communicable illnesses such as AIDS, syphilis, malaria, chicken pox and Lyme disease as well as hereditary diseases like leukaemia, lymphoma, and sickle cell anaemia, which affect the eyes & other parts of the body can also be cured. One main advantage being it is non-contact in nature & hence a protected biometric parameter as the retina is at back of the human eyes. Pregnancy also affects the health of the eyes. Likewise, indications of chronic health conditions such as congestive heart failure, atherosclerosis, and cholesterol issues first appear in the eyes.

7 Conclusions

Retinal In this overview/survey paper, the examination work done till date in the field of bio-metric acknowledgment using retina scans done by various authors till date is presented, which was gathered from different sources. Different issues w.r.t. the drawbacks of the works done by the various researchers was deeply examined, analyzed, studied in greater depth in more prominent profundity. This research article, thus may find of more importance as a base paper for those who want to pursue further research in the field of biometric recognition using retinal part of the human eyes.

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