

Preliminary Study on Iris Recognition System: Tissues of Body Organs in Iridology

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Abstract— Iris recognition gives many advantages to those who practice iridology in order to detect symptom in patient's iris. In iridology, there many factors in it iris analysis have to be considered due to complex iris's structure. Practitioners have to measure color of iris, its density, sign on iris image and the location of body organ in iris image as stated in iridology chart. Currently, iris diagnosis systems have certain weaknesses. This paper proposed an approach to discover those problems. An accurate iris image will be obtained by using new segmentation technique in iris recognition which called water flow method. This research expected to fulfil all the iridology practitioners need in order to diagnose patient health.

Keywords— Iris recognition system, iridology, water flow method.

I. INTRODUCTION

The human iris is an annular part between pupil and cornea (see figure 1). Iris is regarded as an inner organ of human body. However it may be easily observed from exterior. Iris has a very fine structure that contains five layers of fiber like tissue. These tissues are very complex and reveal in various forms. The surface of iris also contain very complex structure such as crystals, thin threads, spot concaves, radials, furrows, stripes and other [1]. Iris is a place where our nerve systems are situated and it can be data screen to give information about human body [2] which called iris diagnosis (iridology).

In iridology, iris color, structure and special marking give valuable information about the patient as a whole to the practitioner. From [3], mentioned that your eyes reveal the real you which the eye communicate in a special way for the iridologist. This leads to the hypothesis that iris information contains some data about our genetically inherited tendencies, congestion and predisposition towards inherited health pattern [4]. The iris reveals body constitution, inherent weaknesses, level of health and transitions that take place in a person's body according to the way one lives [5]. The iris charts on Figure 2 divide the iris surface into finite number of segments, each segment being associated with an internal organ, apparatus or system [6]. Taking the view from the front we can see the basic correspondence organ like brain, digestive system, heart and kidney. The positions of those organs are reflection to each other between right and left iris. The

convention is to use position of clock to locate organ rather than degrees [2,17]. Since iris contain large amount of blood vessel and nerves, changes in the body organs condition will be appear on the iris [1]. Therefore, in iris we can see many distinctive features like color type such as brown, blue or mixed, structure type such as high resistance iris, self protective iris, grandular or etc and iris sign such as lacunae, fiber, furrow, pigment or etc [7].

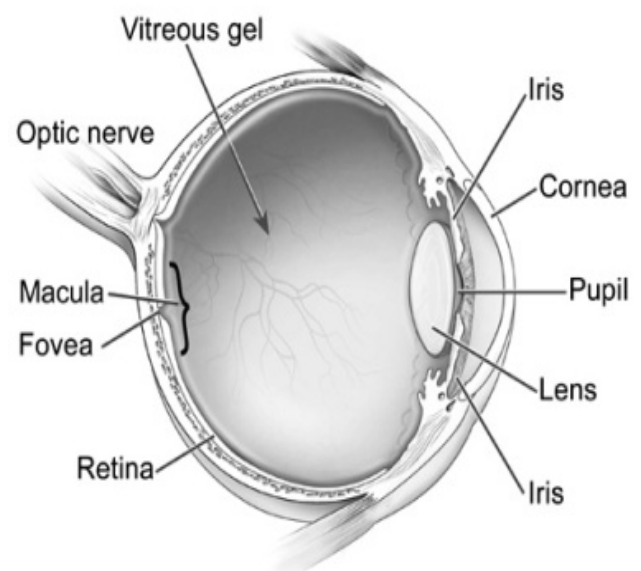


Fig. 1 Human Iris

In traditional iris diagnosis, the doctor firstly uses a microscope and a slit lamp to examine the patient's iris, and then identifies symptoms on the basis of professional knowledge, finally makes a handwritten record of the examination. Obviously, this process has some fault. The slit lamp is tiring for the eyes of both doctor and patient. And the examination and identification are very subjective and dependent on the experience of the doctors [8]. From [5], most of the iridology's practitioners do the diagnosis by their own style or without the systematic program. This is unsafe for the

patient especially for those who are suffering with chronic disease.

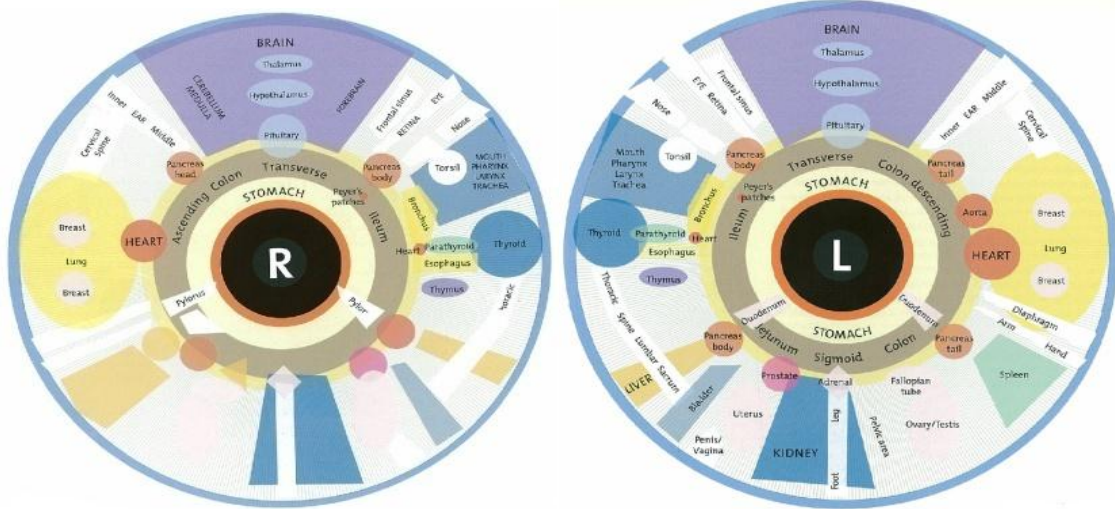


Fig. 2 Iridology chart.[7]

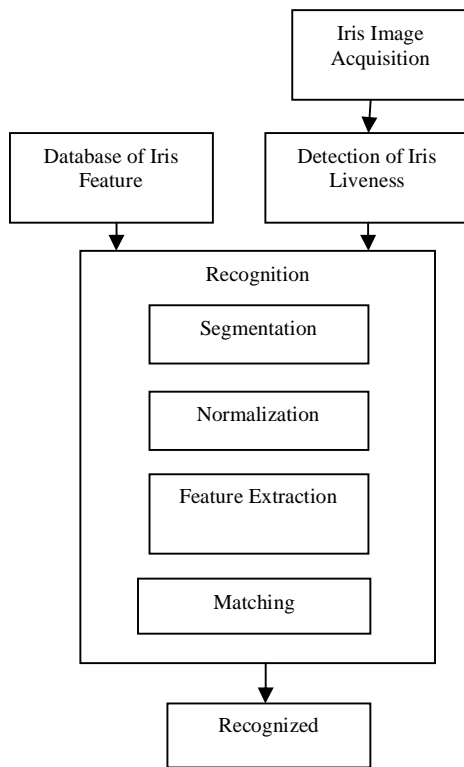


Fig. 3 Diagram of a typical iris recognition system.

Therefore, there are many iris recognition system was built with different technique with the same objectives which is to produced better iris image and to be used in many field such as biometric and iridology. A typical iris recognition system is shown in Figure 3. It consist of three major building blocks which are iris image acquisition, detection of iris liveness and recognition [19,20]. Especially in iridology, many systems were produced to help iridologist practitioner in order to get

greater iris image which can help them to diagnose the patient's condition. Besides that, new segmentation technique introduce by [23] which call water flow method will be used in this research. The purpose of this paper is to review some worked done in iris recognition system, especially in iridology and to overview the proposed approach to be used in this research later.

II. LITERATURE REVIEW

Important application in pattern recognition is computer-aided diagnosis. It is aiming at assisting doctor in making diagnostic decision. The final diagnosis is of course made by the doctor. The needs for this application are because medical images are often not easily to be interpreted and the interpretation can depend very much on the skill of the doctor [14]. Researches on recognize iris image are called iris recognition. Many researches on iris recognition in the field of computer science and artificial intelligence that require accuracy of segmenting are automatic personal identification and iris diagnosis (iridology) [19, 16]. Early speculation and idea about iris recognition is in 1985 but until 1989 Daugman has created actual methods and algorithm for iris recognition also patented it. Around 1993 to present this algorithm had been commercialized and had been used widely in human identification area as had been done by [10], [11] and many more [9]. These efforts give valuable advantage to researchers who want to help iridology practitioner to get accurate iris image in order to detect changes in patient's iris.

Historically, iridology was firstly found by Dr. Ignatz von Peczely. From the findings after many years of research work by prominent doctors, most of them are medical men, all organs of the body have been represented in charts (figure 2) developed through the effort from various doctors [2]. Iridologists skilled in the art of interpreting iris patterns for diagnose people's health, personality and mutual compatibilities. Iridology is a novel approach of medical

diagnosis because there are no touching, no damage, no paint and high precision [16]. Conventional diagnoses are all disease oriented and probably conclude with the doctor or practitioner give an assumption on what they are thinking about patient's condition. It will give fear and depression to the patients [17]. Most of the iridology's practitioners do the diagnosis by their own style or without the systematic program [5]. The computerization of iris analysis will assure objectivity in iris the examination process because the computer can analyses the image [3]. Furthermore related work in iris diagnosis system will be discussed.

In iridology there is many aspect have to be considered by researchers because the practitioners have to determine on iris color, structure and special marking such as fiber, stomach ring, pigmentation, lacunae, fiber, furrow and others. Recently, many researchers had produced automated or semi automated iris diagnosis system. They have the same objectives which want to help iridology practitioner and analyze the iris image to use by the practitioner.

In [4], interface of iris detection program is build to facilitate the user who not familiar to the software. In this system, Canny edge detection and Hough transform were use to detect the edge and circle of iris. The processes of this system are quite slow because the pictures are large and iris detection is 80% match caused by poor quality of the picture. Lodin [6] has proposed improvement to create semi automated system from [4], in iris recognition and identification step Hough Transform is use to detect iris's circle. Then in iris pattern analysis, iris color is identifying by pixel luminance value computation method before identifying the interest regions in iris's chart on surface analysis done. In this phase 10 important internal body systems are represented using distinct color and it will be matched to the patient's iris which any differences in iris will be marked as dark and light. Lastly, patient final diagnosis has built and must be approved by iridologist.

In [12], system on detecting cholesterol presence has built by looking at arcus lipoides (arcus senilis or sodium ring) in human iris. Hough transform were used to detect edge of iris and pupil circle. Image has been normalized using Rubber Sheet model then Otsu's threshold method and plotted histogram of iris are use to determine whether the eye has the ring or not. As a result, the eye with threshold value above 139 can be detected with arcus lipoides. In [1], a system to recognize alimentary canal disease by (radii solaris in 11 and 13 o'clock location) and nerve system disease (collerate texture become more rough and stomach circle is often damaged) has built. On iris image pre-processing stage, one algorithm with a rough localization step and precise localization step is use to detect the inner and outer boundaries of the iris. While, to remove the highlight spot on, the iris auto-adaptive neighbouring insertion method is used. 2-D Gabor filter is used to distinguish iris texture whether it is normal or iris with radii solaris or iris with hyper pigmentation. Then, fractal dimension is calculated to give the description of the roughness of various textures. On disease recognition, support vector machine is used.

Shen [8] is developed an approach to detect lacunae in iris which lead to chronic diseases such as bronchitis, brain dysfunction and erectile dysfunction. This approach was namely as LDoG. This approach normalizes the iris image using pseudo-polar coordinate system, then filter normalized iris image using Gaussian filter in vertical orientation. After that, threshold is used to convert this original image into binary image. Finally thinning algorithm is used to thin binary image and eliminates useless profile. In [5,13], diabetes mellitus is detected by looking at pancreas organ at 07.15-07.45 o'clock in iris after the stomach area. Standard tools are prepared to avoid shifting the area of pancreas. Then some image processing methods conduct image analysis such as take the region of interest, transforming image to grey level, filtering the iris image with minimum filter, enhancing final result and finally location of pancreas in iris is taken.

Most of works in iris recognition think that iris outer and inner boundary is circle like done by [1, 4, 6, 12] but in [15] discovers that the pupil boundary is noncircular and the iris outer boundary is also noncircular. From [6], the differences in iris mark as dark and light then it will be matched to the iris chart. Problem here is we cannot measure the mark sign whether it is on acute, sub acute or chronic stage. Other problem is iris chart that used to match with patient's iris image in this system are static, it should be more flexible because iris dimensions vary slightly different between individuals as mentioned in [18]. In [5, 13], one technique on localization should have to consider by researcher in order to overcome the shifting of iris. Besides that, [1, 4, 5, 6, 8, 12, 13] no phase in determine right or left iris. In iris chart in figure 2 and present by [2, 3], we know that there is a different between right and left iris on area of body organ and the area is reflex to each other. Those are the weaknesses that we can see in previous work. From those entire work discusses above, we understood that in most state of the art iris recognition scheme, the main emphasis has given on iris segmentation and feature extraction strategies. Our approach to overcome those problems and to make the process easier will discuss in next section. Furthermore, new segmenting technique which called water flow will be used to get better image.

III. PROPOSED APPROACH: THE MAIN STEP

Purposed of this scheme is lead to iris diagnosis system. We proposed our iris recognition scheme into several steps (Figure 5) which are:

- Localization

This part is to detect circle of iris and circle of pupil. At this stage we assume those two parts as circle. The circle is used to isolate the eyelids and in here the noise from light reflection will be removed. Basically in iris diagnosis, iris image captures are free from eyelid and eyelash.

- Determine right or left

This part is very important in iris diagnosis because part of body organ is not the same in left or right irises. Punctum

lacrimale or tear duct will not be used here to determine right or left eye like had been used in [21] because sometimes there is no tear duct captured. Iris localization is important because from there we can measure center of iris and center of pupil in coordinate system. If we get the x -coordinate of the center of pupil is smaller than x -coordinate of center of iris then classify it as left eye image and vice versa. If the two coordinates are exactly the same eye shape analysis will be used [22].

- Determine iris color

As mentioned in [7], human have 3 types of iris color whether it is brown, blue or mixed iris color. Here iris color analysis will be done to specify whether it is brown, blue or mixed iris color.

- Iris segmentation

Segmenting iris image is difficult task because iris contains complex structure even iris and pupil boundary are not circle on many cases. There are many segmenting techniques or methods had been introduced before like edge detection, region growing, statistical approach, mathematical morphology and one of the successful and popular technique is the family of active contour based method or snakes. In this research, water flow analogy will be used in order to segment iris image because it provides geometrical flexible and topological adaptable which very useful in medical imaging due to its image complexity (see general structure of water flow method in Figure 4). Other than that this technique used physical analogy, not like other segmentation technique which involves high computational cost and increased degree of complexity [23].

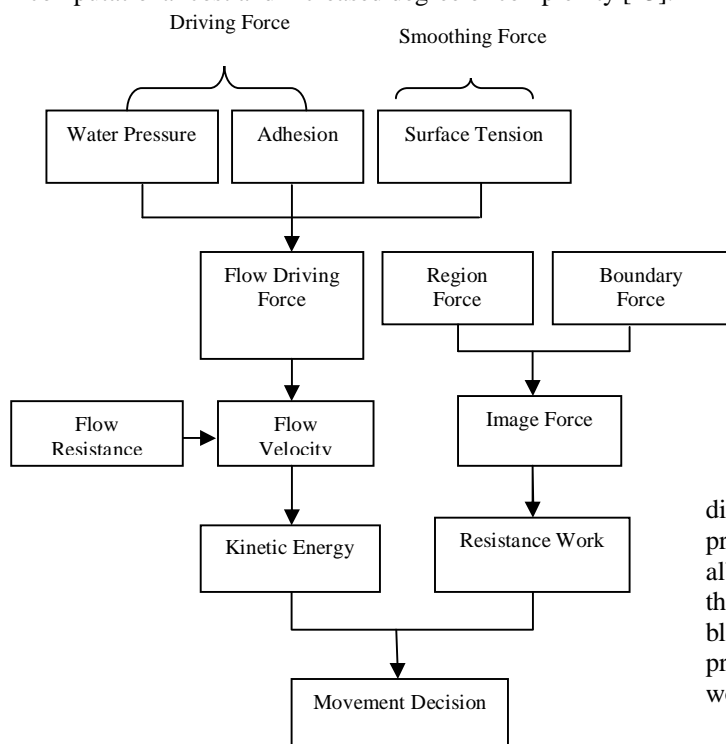


Fig. 4 General structure of water flow method

- Feature Extraction and selection

This is the important part after segmentation. In this stage, we have to determine the density of iris image, the shape of iris and pupil whether they are circle or not, the rim sign on iris, the lesion on iris and many things to be considered as stated in [2, 3, 7].

- Matching

Here, combination result from step 2 and step 5 will be matched to iridology chart in figure 2 to determine the location of iris sign and which organ involve.

- Classification-disease recognition.

In this stage, result from step 3 and step 6 have to analyse according to iris sign obtained. Here, the system will be learned how to determine disease, organ involve and disease condition whether it is acute, sub acute or chronic.

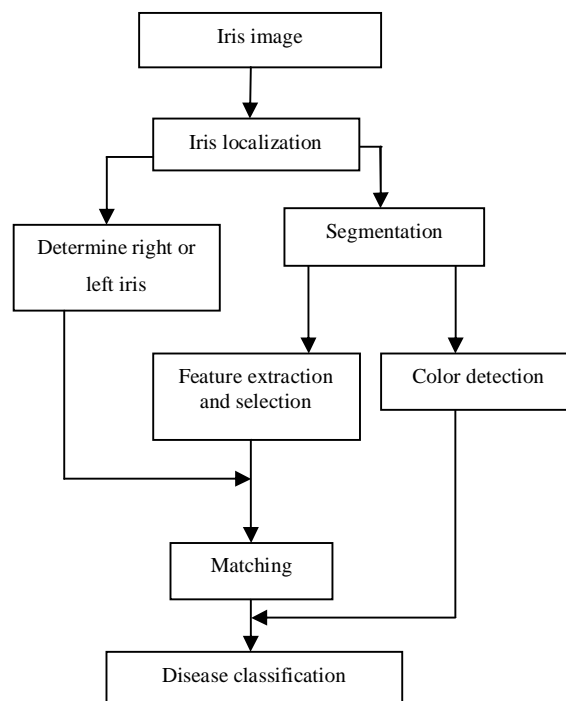


Fig. 5 Diagram of proposed approaches

IV. DISCUSSION

Even though iridology has many advantages on patient diagnosis but there certain iris which unable through iridology process especially iris with pathological problem like anirida, albinism, essential iris atrophy and tumor [24]. Besides that, there are certain thing that iridology unable to measure such as blood pressure level, whether a subject is female or male, the present of syphilis and others which stated in [3]. For further work, in order to ensure that our proposed work are good or

not, comparison with common system on iris diagnosis will be done to get the performance and accuracy.

V. CONCLUSION

Recently, many iris diagnosis systems are building and there are many technique produce to get the better segmentation image. From this paper, the weaknesses on existing iris diagnosis system obtained and one proposed approach have been present. In order to get the correct result in disease recognition part an expert will be invited to join this research.

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