Survey on Human Prakriti and Tridosha (Vata, Pitta and Kapha) Based on Physiological Features Using Machine Learning and Image Processing Techniques

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Abstract: Human Prakriti and Tridosha are vital for human health and fitness as per Ayurveda. Human prakriti can identified by many ways in Ayurveda. Physiological features of human body are one of the essential measure to diagnose prakriti constituents. With the help of image processing techniques of computer science, we can make the process of identification of human prakriti in automatic way. In this paper, we studied exhaustive literature survey based on three aspects: prakriti and tridosha, physiological features and contribution of machine learning and image processing. We also identified research gaps based on literature survey. We have also proposed a model based on image processing in order to classify human prakriti based on physiological features from images.

I. INTRODUCTION

In modern era due to spread of mysterious viruses like Corona, enhancing human body immunity plays a vital role in upholding finest health. Ayurveda proliferates the favors of nature in preserving vigorous and pleasurable living. In Ayurveda, the health of human being is being measure by keeping three doshas or Prakriti i.e. Vat, Pitta and Cough in mind. There exists a strong relationship between these doshas and immunity of body. The human being, who has balance of all Tridosha, will not suffer from any diseases. Balance of Tridosha is indispensable for human being to be healthy and immune. Most common means to measure Tridosha is pulse reading. Pulse reading is distinctive technique in Ayurveda where physicians place the index, middle and ring fingers on the wrist and measure the strengths of vata, pitta and kapha doshas respectively [20]. This technique has been use in Ayurveda for long time however; it is lacking of quantitative measure of the reliability and needs dominant expert in order to get accurate result. The other important technique to classify the person in Tridosha is based on Physiological features like hair, eyes, nose, lips, skin color etc. In this second technique, in order to classify human prakriti or Tridosha, we need to extract some features from the parts of human body. In this technique if we train the computer based on some image processing techniques it automatically retrieves features from the images of human body parts in order to get prakriti of human being.

Digital Image Processing is the sub category of digital signal processing that process digital images using algorithms in order to get meaningful insights from it. Digital Image Processing plays a vital role in extracting features from the images of physiological parts of human being. It involves several steps such as:

→ Segmentation of Images from dull background and poor lighting conditions
→Feature Extractions using algorithms
→Recognition or Verification
→Improvisation using algorithms to enhance accuracy

II. RELATED WORK

We have divided literature survey of this proposed research in three main categories.

A. Related to Prakriti and Tridosha

In the paper [4], authors described the importance of prakriti in human life. They narrated relationship of

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prakriti and human health. They concluded that the Prakriti plays key role in deterrence as well as controlling of routine disease. Authors in the paper [4] also made similar kind of conclusions. They described the concepts prakriti in Ayurveda and its significance in eluding lifestyle sicknesses. They narrated correlation with prakriti, Ayurvedic conditions and life style disorder. In 2013, Hemangini Waghulade described [6] that the three doshas performances as management, regulatory the day-to-day activities of the body. She described the role of prakriti in vocational guidance. In the paper [12] authors emphasized, that in the In Ayurveda system of medication people are categorized into seven composition types based on prakriti. These are called either pure types (V, P, K) or mixed types (VP, VK, PK), or an equal type (VPK). They added that Prakriti assessment comprises medical examination including questions about physiological and behavior attributes. Author in the paper [8] described the importance of prakriti in human health and came out with bio statistical approach to quantifying these Tridosha. In another effort [12] authors relate prevailing prakriti traits to body mass index (BMI) of people by evaluating an adequate tool to provide the quantitative measure to the currently qualitative Ayurvedic prakriti determination. They also gave the importance of prakriti in human for healthy and fit life. Authors in [12] identified that prakriti might help in personalizing rehabilitation or envisaging proneness to a disease. In the paper [13] authors explored whether the prakriti as described in Ayurveda has molecular correlates. They did integration of Ayurveda with genomics for future predictive medicine. Authors in the paper [16] mentioned that Prakriti, for its palpable effects upon decision making in Ayurvedic medical practice, entails a systematic and infallible method of examination.

B. Related to Physiological features and Tridosha

In the paper [6], author represented intangible study about tridosha and its directly regulatory all physiological features with respect to the supremacy of each dosha. In paper [9], authors pronounced inimitable practice to analyze disorders related to prakriti and tridosha with pulse waveforms and analytical system with negligible intrusion of nearby noise. In 2015 [9], authors believed that with the help of diagnostic system and machine learning as well as experts from Ayurveda can detect doshic disorders in faster way with greater independence. Author of the paper [15] in year of 2016 , author designed a prakriti assessment method to identify correlation between prakriti and different physiological features such as heart rate, systolic blood pressure, diastolic blood pressure, haemoglobin(Hb%) and many more. After studied author concluded with remark that each of these physiological parameters and its constitutional type of Ayurveda were correlates to tridosha as well as all the parameters did not express substantial connection with prakriti. In recent year, author of the paper [17] described existence of tridosha were always found in living body. Each of these dosha is having their own biological process. He also mentioned about various biological processes carried out by each dosha as well as meaning of each dosha. He also elaborated that when Panchmahabhut (Akash, Vayu, Agni, Prithvi, and Jal) meets atma, then tridosha can be figure out. In paper [14], authors compared answers of the questions, which was of two types subjective, and objective for assessment of prakriti based on the concept of tridosha. Authors had not normalized the values of particular age group from the location of India. However, authors developed an administrable tool to determine nature based on tridosha enhances new aspect to new system of Ayurveda. It was also recommended that prevention and cure can promoted in changes of life-style. In paper [1] authors at very first time came with an idea that haematological parameters of blood cell from an infant was differed according to prakriti. Although the accuracy will be added part if it was been.

C. Related to Physiological Features, Machine learning and image processing

In paper [18], Authors took help of hardware and application software to diagnose pulse with minimal errors and with the use of software Ayurvedic doctors can have all-time records of the patient. Author collected small amount of samples so there has to be chance of increasing accuracy in future. In paper [19], authors represented the comparisons between various machine learning algorithms such as K-neighbor, artificial neural network, support vector machines, Naïve Bayes , decision tree XG-Boost and CatBoot methods to predict human body constituents(Tridosha) with various parameters . For knowing misbalancing in dosha this is very good work to reference. In 2016, Hetal Amin [5] gave insights for datamining and its usage in Ayurveda. In paper [2], author discussed data mining steps, practices and applications in the field of Ayurveda. With support of

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smart phones, datamining and Ayurveda, author clinched that imminent era will be of Ayurinformatics. Authors in paper [11] pronounced importance of supervised machine learning and unsupervised machine learning. They also mentioned reinforcements of machine learning algorithms as classification, regression. Authors compared Decision Tree, Support vector machine, K-Nearest Neighbor, Naïve Bayes, Linear regression along with their objectives, working mechanisms, advantages, limitations and implementation tools.

For identifying Physiological features and tridosha one has to deal with images of human living organisms hence, we required detailed study of image processing and segmentation. In paper [21], author described various image-processing techniques to retrieve information from an image after performing series of steps. Various image-processing techniques such as Threshold based image segmentation, region based image segmentation, Edge based image segmentation, Fuzzy theory based image segmentation, ANN based image segmentation, Partial Differential Equation (PDE) based image segmentation had been overviewed. After studying these techniques, it seems that one has to use hybrid approach to uphold the accuracy and feature extraction from an image. In paper [10], authors described three main stages image processing called as (i) Reconstruction (ii) Transformation and (iii) classification and various methods of image segmentation. Authors in year 2018, [3] sentiment analysis with respect to facial expression, deception detection, emotion recognition and stress detection has been suggested by using thermal images of human being. Authors concluded with the remark that for various health monitoring system a multimodal feature extract will be need to cure and prevent disease. In paper [7], authors represented work done on images of leaf and flowers, which were collected using CNN and based on result, generate by their model, they gave name of plant for the respective leaf or flower with greater accuracy.

III. DISCUSSION BASED ON LITERATURE SURVEY

Based on the exhaustive literature survey of three aspects mentioned in section 2.1, 2.2 and 2.3. We have derived several insights from them. Literature survey clearly stated that Tridosha, Prakriti plays a vital role in human health. There exists strong relationships between prakriti of person and physiological features. Table 1 describes the relationship between physiological features and

Tridosha related to Vata(V), Pitta(P), Kapha(K).

Table 1. Relationship between Physiological Features and Tridosha

Sr.No	Physiological Feature	Tridosha (V,P,K)		
		V	P	K
1.	Eyes	Black, Brown, Small	Bright, Gray, Green, Yellow, Red	Big, Blue
2.	Face	Angular, Thin	Triangular	Rounded
3.	Nose	Nasal air passage smaller	Long, Red	Short Rounded
4.	Lips	Cracked, Black/Brown	Red, Yellowish	White, Pale
5.	Teeth	Big, Thin gums	Medium, tender gum	White, Strong gums
6.	Skin	Thin, Dark	Smooth, Rosy	White, Pale
7.	Hair	Brown, Black	Grey, Red	Wavy, Oily

Image processing techniques play an important role in order to automate the process of identification of human prakriti based on physiological parts. Image processing techniques comprises of several functions such as crop, segmentation, lighting correction, deskew etc. that makes this process of identification possible. Literature survey shows that people in real environment do not carry out such work.

IV. RESEARCH GAP

The following are the key observations, which we found during the literature survey process.
- Physiological features of human play a vital role in the identification of human prakriti. Human prakriti is vital for the immune system. Exhaustive literature survey is not available with the consultation with the experts in Ayurveda in order to identify Human prakriti.
- No automation system is available that identify prakriti of Human based on images of various

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physiological features.
- As far as image processing is concern, there is need for enhancement in classification accurateness to attain decent quality image after segmentation.
- There is a need to construct algorithm for automatic classification of prakriti of human being based on physiological features.

V. PORPOSED WORK

Based on above stated research gap, we have envisioned concocting a working model that will be used to classify physiological prakriti constituents from image. The proposed model of classification of physiological features is shows in Fig 1.
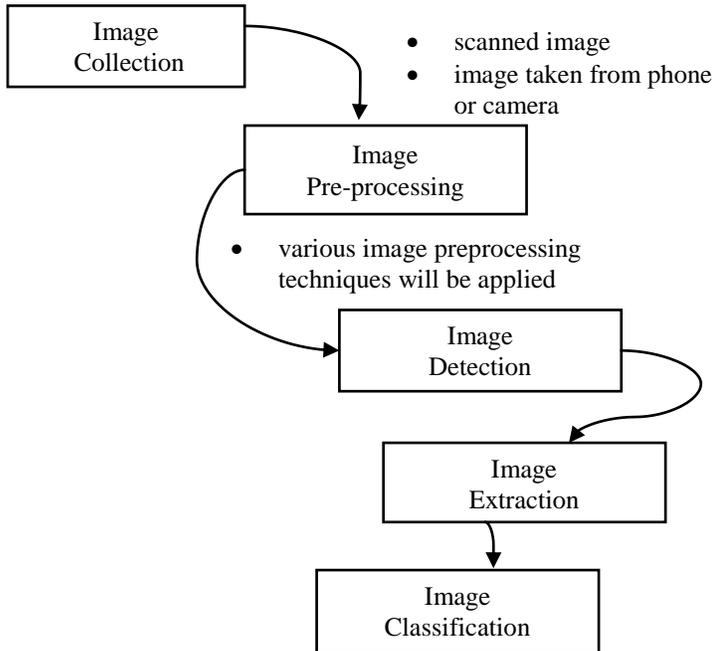
Fig. 1. Proposed Model for classifying Physiological Features

The proposed model comprises of several steps described as follows:

A. Image collection
It is an initial and simple phase of image processing where we will be going to collect images of front side face of a human, which covers all the physical components of respective human face like hair, chick, chin, nose, eyes, and lips in digital form. Image will be taken with the help of camera configured with device like mobile phone or web camera. To process on images color modelling will be used. This step is also called as image acquisition in the field of digital image processing.

B. Image pre-processing
This step is used to get more accurate and efficient recognition rate of physical components of a human face. For extracting features from human-face, we will be going to use various techniques such as Wavelet transform, discrete cosine transform, color normalization methods like intensity normalization and grayscale normalization methods. During the study, we found that wavelet transform method provides an effective framework to remove noise from the images, compression, and fusion and so on.

C. Image detection
It is essential to have an intelligent vision-based human computer interaction as per as human face detection is concerned. Hence, to correlate object with the image, segmentation will be required. During this step, we will be going to partition the pixels of image into its constituent region or an object. In this step image will divided into foreground and background with various attributes so that we can get more accurate colour various physical components of human face such as like hair, chick, chin, nose, eyes, lips.

D. Image extraction
This step will provide a vital role, as we have to classify physiological features from an image. In this step, we will extract geometrical structure from an image. Hence, various method of feature extraction will be applied. Firstly, we have to identify size and shape of a colored image. Using principle component analysis (PCA) we will verify human face and its physical components. Various machine-learning algorithms such as Support Vector machine. K-nearest neighbor and many more will be applied to classify the components in rough manner into eyes, nose, hair, chick, chin, and lips.

E. Image classification
In this step, we will classify images according to prakriti of human being. Every image will be classified as Vata, Pitta or Kapha. Fig 2. Describes the classification for image of an eye based on different prakriti constituent as sample.
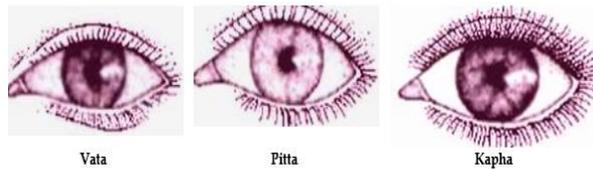
Fig. 2. Classification of Human eye based on Prakirti sample.

VI. CONCLUSION

Based on the literature survey of human prakriti and tridosha, we concluded that image-processing techniques of computer science might play an important role in the classifying tridosha based on images of physiological features of human body. We also concluded that several research gaps are exist in context to study as well as implementation of image processing techniques. Based on the research gaps identified, we have proposed an image-processing model that comprises of several framework activities in order to classify images of physiological features automatically in various classes of prakriti.

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