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REVIEW ARTICLE

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"AYURVEDIC DOSHAS IDENTIFICATION USING FACE AND BODY IMAGE FEATURES" – A REVIEW

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Abstract: Ayurveda is an alternative medicine system with historical roots in India. In Ayurveda, any disease is considered to be caused by the imbalance of various Doshas (Vata, Pitta & Kapha) in human body. In order to diagnose this imbalance of doshas, there are several methods, out of which one is to observe visually the different features of the human body. Body type, skin type, hair type, eyes type, face type, etc possess different characteristics under the influence of various doshas. Hence the idea is to automate this process where we scan a body image using machine learning and deep learning algorithms and classify the different features into different doshas to finally conclude the dominant dosha as result.

Keywords: ayurveda, ayurvedic doshas, dosha identification, ayurvedic diagnosis, vata pitta kapha, machine learning

I. INTRODUCTION

Ayurveda is an ancient science for understanding our body and mind so that we can achieve good health and a long life. In Ayurveda, a body is considered as the combination of five fundamental elements: Earth, Water, Fire, Air and Ether. In order to stay healthy, a proper balance of these five elements is necessary. Further, as our body is a complex system, Ayurveda has classified three different combinations of these elements which represent different functions in our body, they are known as Vatta (combination of Ether & Air), Pitta (combination of Water & Fire) and Kapha (combination of Water & Earth). If there is any imbalance of fundamental elements in our body, these combinations will get affected and the affected combination(s) will become dominant. Any dominant combination will hence show its effects by building certain features of the body – physically and behaviorally.

Any disease in our body is understood as an imbalance of these elements in our body, and to diagnose the same we check for these combinations (Vata, Pitta & Kapha), the imbalanced one is known as Dosha while diagnosing. To figure out dominance of these doshas, we have many techniques in Ayurveda like Nadi reading (detailed pulse diagnosis) and Feature reading. Just by looking at someone's physical features of the body or by co-relating their behavioural features, we can identify which dosha(s) is/are dominant in their body. For e.g If a person's body is thin and tall built will low weight, he/she possesses dryness in their biological system and is very fast in his/her activities, it means Vata Dosha is dominant in that person, similarly if someone is heavy in weight, large built with slowness in activities we can say that there is Kapha Dosha dominant in that person.

This classification used to help diagnose many diseases from just the physical appearance of people and hence curing them by correcting their lifestyle and using herbs. In order to preserve this technique, we can take advantage of modern science & technology. With the help of image recognition, we can identify various features of someone's body, tag them with their types and hence figure out which doshas are dominant. This is the fundamental idea of this work.

II. TYPES OF DOSHAS

There are 3 fundamental doshas, Vata, Pitta and Kapha, hence there can be 7 different combinations of doshas which can exist in a body as mentioned in Table 2.1. These variations can be seen expressing more physical characters of the body.

A. Vata Dosha

Properties of Vata dosha are dry, light, mobile, rough, cold and swift nature. A person having this dosha will show these characteristics in physiology, morphology, mental and physical behavior. Vata person is tall and thin with small body frame having long face with sunken cheeks. Their skin shows dryness, roughness and lack of luster. They are intolerant of cold and they are physically weak. They don't have sound sleep and show restless in nature. Their mind is also never steady and they forget things easily. Also, they are talkative and active.

B. Pitta Dosha

Properties of Pitta dosha are hot, sharp and liquid in nature. A person with Pitta dosha will show these characteristics. They are generally medium built with medium height. Their skin is very soft, reddish and shows luster. Their nails, eyes and tongue have coppery red color. Their appetite is high and they have moderate strength and stamina. They cannot tolerate heat and they have sharp intellectual mind. Also they present clarity of mind and sharp talk.

C. Kapha Dosha

Properties of Kapha are heavy, soft, cold and unctuous. A person with Kapha dosha has these characteristics. They have large body frame and are usually overweight. Their skin is unctuous, soft and moist but also pale and cold. They have big beautiful white eyes and chubby cheeks. Their appetite is low and they show sluggish activities. Their sleep is very long and they speak slowly with a deep voice. They are less active and calm but have good stamina [1].

Table 2.1 Types of Doshas [2]:

Type	***Description***
V, P, K	Predominant in one Dosha
VP, VK, PV	Two relatively equal proportions with one predominating
VPK	Doshas in almost equal proportion

III. BODY CONSTITUTION CHART

The psychosomatic constitution of a body, depending upon the relative predominance of three doshas can be divided into 7 categories, Vita, Pitta, Kapha, Vata-Pitta, Vata-Kapha, Pitta-Kapha and Samdosha as mentioned in Table 2.1. Each of the body feature has certain characteristics, using which we can determine the type of dosha. These characteristics of different body features are shown in Table 3.1. The constitution provides insights into the deeper workings of some individual. With proper identification, it is possible to be aware of the diet, spices, medicines, thoughts, emotions, climates, lifestyles and colors that can lead to balance or imbalance of an individual. Also various diseases can be foretold, diagnosed and prevented by analyzing the constitution. It also helps in determining the progress and effectiveness of therapy for effective treatment.

Table 3.1Characteristics of Tridosha [2], [3]:

No.	***Observation***	***Tridosha***		
		Vata	***Pitta***	***Kapha***
1	Body size	Slim	Medium	Large
2	Body weight	Low	Medium	Overweight
3	Cheeks	Wrinkled/sunken	Smooth flat	Rounded, plump
4	Face shape/ chin	Thin, angular	Tapering/ triangular	Rounded, double chin
5	Eyes	Small, sunken, dry, active, black, brown, nervous	Sharp, bright, gray, green, yellow/red, sensitive to light	Big, beautiful, blue, calm, loving
6	Nose	Uneven, deviated septum	Long pointed, red nose-tip	Short rounded, button nose
7	Lips	Dry, cracked, black/brown tinge	Red, inflamed, yellowish	Smooth, oily, cool, white, pale
8	Teeth	Stick out, big, roomy, thin gums	Medium, soft, tender gums	Healthy, white, strong gums
9	Skin	Thin, dry, cold, rough, dark	Smooth, oily, warm, rosy	Thick, oily, cool, white, pale
10	Hair	Dry, brown, black, knotted, brittle, scarce	Straight, oily, blonde, gray, red, bald	Thick, curly, oily, wavy, luxuriant
11	Appetite	Irregular, scanty	Strong, unbearable	Slow but steady
12	Digestion	Irregular, forms gas	Quick, causes burning	Prolonged, forms mucous
13	Thirst	Changeable	Surplus	Sparse
14	Emotions	Anxiety, fear, uncertainty	Anger, hate, jealously	Calm, greedy, attachment
15	Mind	Restless	Impatient	Calm
16	Intellect	Quick but faulty response	Accurate response	Slow, exact
17	Speech	Rapid, unclear, talkative	Clear, sharp, penetrating	Quiet, slow, monotonous
18	Voice	Weak, hoarse	Strong tone	Deep, good tone

IV. METHOD

As we know that various diseases are caused by the imbalance of doshas and in order to identify the dominant doshas there are mainly 3 different methods [4]:

1. ***Sparsha:*** This is a touch based diagnosis where heart rate and body temperature are analysed by placing fingers around the wrist of an individual.
2. ***Prashna:*** This is a question based diagnosis where an individual is questioned about their lifestyle, sleep-pattern, appetite, levels of energy etc.
3. ***Darshana:*** This is a visual diagnosis which is performed by observing the physical features of an individual's body like body frame's build, height, weight, hair, skin, teeth and eyes.

With evolving Machine learning algorithms and high computational power, image-recognition has evolved a lot. We can extract the facial features and body features for various applications. The same process we will be using for Darshana based Ayurvedic Doshas identification. The results of body type and facial feature types will be combined to calculate the dominating Dosha(s) in an individual.

We will classify the following body features using different algorithms:

A. Body build-type analysis

Using the body image as input, we need to analyse the shape of body and then conclude the build whether it is thin, medium or heavy. As we know from constitution chart that Vata people are thin & tall, Pitta people are medium built and Kapha people are heavy built. There are various algorithms available which we can use and train our model to predict the body build like principal component analysis and k-means for clustering the data and producing results.

B. Face shape analysis

Using the face image of an individual as input, we need to analyse the shape of the face. As we know, Vata people have angular face shape with defined cheek bones, Pitta people have pointed chin and Kapha people have rounded face. Active shape model can be used for the classification of face shape. Various geometry shapes like square, ellipse, square, triangle, circle etc are used to calculate similarity with the face using region similarity, fractal dimensions and correlation coefficient [5]. Algorithms detect boundary of the face and in order to classify them in the shapes [6], [7], edge boundaries that are detected using these algorithms can be fed to another model to detect its similarity to a geometrical.

C. Skin Analysis

Using the face image as input, we need to extract the skin features like skin color. As we know, Vata people have thin, rough, dry, dark, grayish black, dark brown, Pitta people have smooth, oily, whitish, warm, pinkish, yellowish and Kapha people have oily, thick, pale, cool, white, wheatish skin characteristics. We can extract the color feature of the skin using the RGB value of the pixels. Various algorithms like multi-layered perceptron, Baayesian classifier with histogram technique, Gaussian classifier and random forest can be used to detect the skin regions in the image. After the detection of skin regions, pixel values of the clusters are evaluated using YCbCr or RGB color space [11], [12].

D. Eyes Analysis

Using the image as input, we need to analyse and extract different features of the eyes like color, eyelids and its geometrical shape, iris, pupil [13]. As we know, Vata people have small, sunken, dry, active, brown or black tones of iris, Pitta people have nervous, sharp, bright, yellow/gray/red-gray/green iris tones, Kapha people have sensitive to light, big, beautiful, calm, loving, blue iris tones of eyes. Deep learning methods can be used to extract the features where we can localize the facial area in the image using Viola-Jones face detector and then segmented using AdaBoost algorithm. We can further extract the eye patches from facial regions using neural network, after which we will use YCbCr or RGB colour space to classify the color or the eye [14], [15].

E. Hair Analysis

Using the image as input, we need to analyse and extract the features of hair. As we know, Vata people have dry, thin, curly, sparse hair and Pitta people have thin, straight, soft, blonde, brownish red, tawny, bald, receding hairline and Kapha people have oily, thick, curly, shiny, black, backish blue hair characteristics. First we will detect the hair and non-hair regions in the image using support vector machines and random forest [16], [17], and then we will label the central pixels where the presence of hair is uncertain [18] and then finally we will classify them in straight/kinky/wavy/curly types using CNN models like VGG-VD, CaffeNet for hair detection [16]. Hair color can be extracted by defining color boundaries using the YCbCr or RGB colour space while segmenting the hair pixels [19].

After classifying the different features of the body into Vata, Pitta and Kapha, we can find out one's effective dosha by adding up the scores of all different features. Whichever dosha will have the highest score, will be the dominant dosha. This way we will be able to conclude the results [3]. Also, it is possible that two or three doshas tie in scores, at that time the we will conclude the combination of highest scoring doshas as dominant dosha. Hence the final dosha can be Vata, Pitta, Kapha, Vata-Pitta, Vata-Kapha, Pitta-Kapha, Vata-Pitta-Kapha.

V. FUTURE WORK

As we have seen that we can analyze the different body features from an image and using the body constitution chart, we can map those features with various doshas. This way adding up all the individual scores, we can then conclude the dominant dosha in the body. This work needs to be carried out using the real data sets in the future and observe if it holds true or not in the real world after training the different machine learning models for different features. Once this approach is proved correct, we can create a web or mobile application that can take individual's picture as an input and perform dosha analysis on the go on it and the results will help many people to correct and optimize their lifestyle according to Ayurveda and prevent the potential diseases in the early stages hence creating a healthier and self-aware society utilizing the traditional knowledge.

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