

APPLICATION OF MACHINE LEARNING FOR TONGUE DIAGNOSIS IN AYURVEDA

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ABSTRACT

- The analysis of tongue image is a very crucial approach in order to evaluate human health in Ayurveda medication.
- The aim of the study is to apply advanced digital image processing and Machine learning techniques to ensure the feasibility and reliability of the tongue diagnosis in Ayurveda which has been attracting extensive attention due to its attribute and convenience to evaluate the patient's health status.

INTRODUCTION



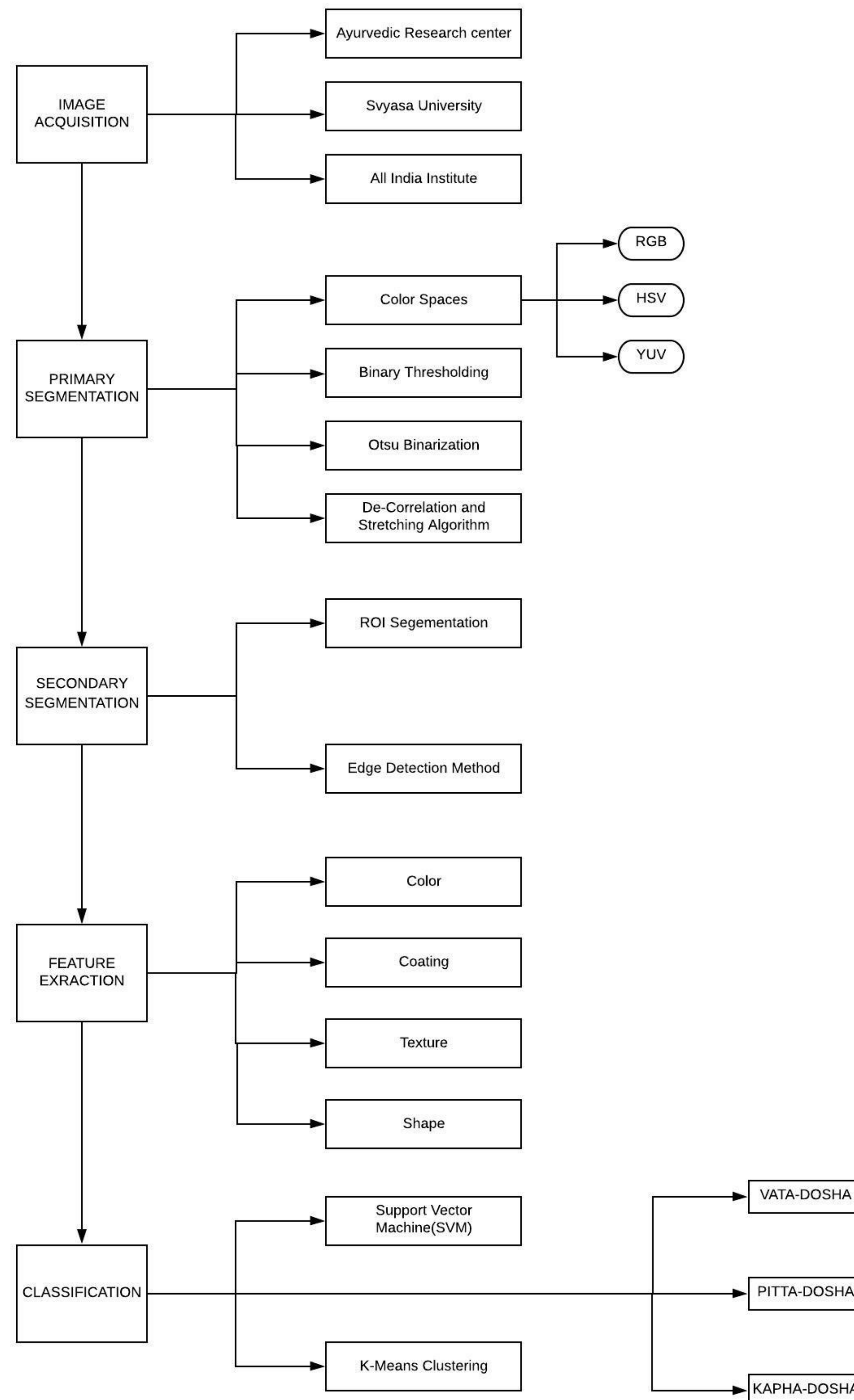
There are three basic principles in Human Body. They are Tridosha's:

- Vata
- Pitta
- Kapha

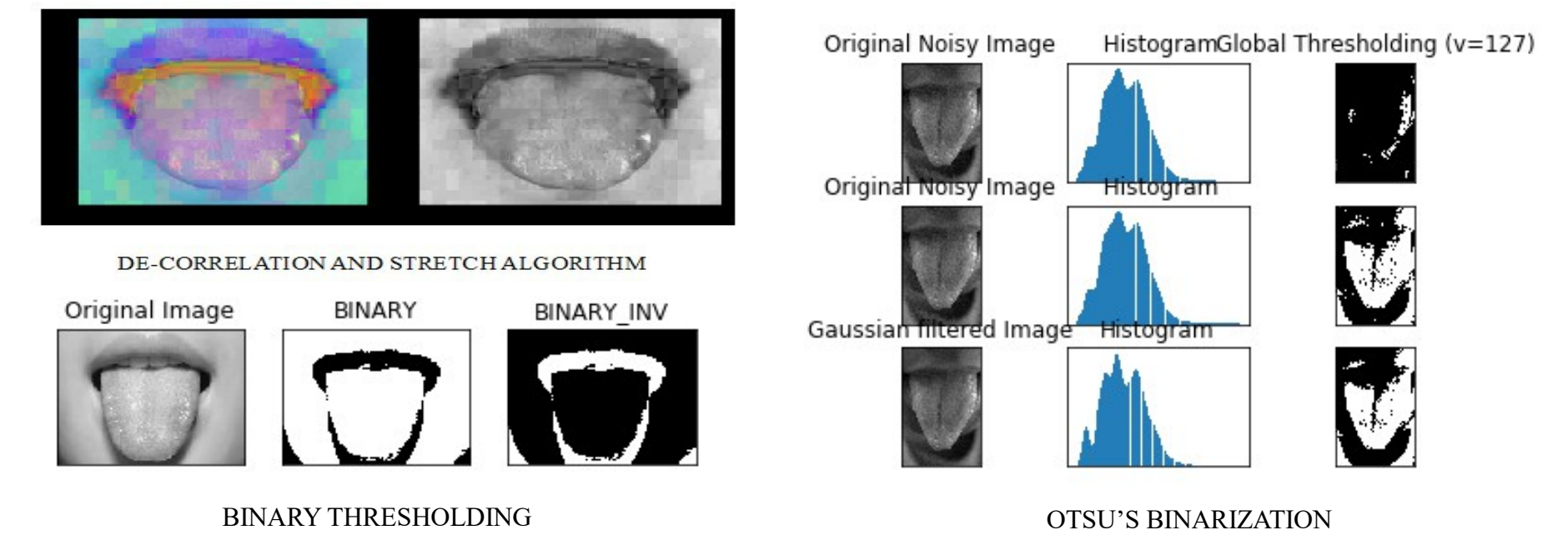


- The ancient art of tongue diagnosis also describes quite characteristic patterns that can reveal the functional status of respective internal organs merely by observing the surface of the tongue.
- A discoloration and /or sensitivity of a particular area of the tongue indicates a disorder in the organ corresponding to that area. A whitish tongue indicates a kapha derangement and mucus accumulation; a red or yellow-green tongue indicates a pitta derangement; and a black to brown coloration indicates a vata derangement..

METHODOLOGY



SEGMENTATION RESULTS



CLASSIFICATION

$$f_{out}(x, y) = 255 \times \left(\frac{f_{in}(x, y) - f_{in_{min}}(x, y)}{f_{in_{max}}(x, y) - f_{in_{min}}(x, y)} \right)^\gamma$$
$$\text{Precision} = \frac{tp}{tp + fp}$$
$$\text{Recall} = \frac{tp}{tp + fn}$$

$f_{out}(x, y)$ is the color level for the output pixel (x, y) after the contrast stretching process. $f_{in}(x, y)$ is the color level input for data the pixel (x, y). $f_{in_{max}}(x, y)$ - is the maximum value for color level in the input image. $f_{in_{min}}(x, y)$ - is the minimum value for color level in the input image, γ - constant that defines the shape of the stretching curve.

FEATURE EXTRACTION

Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval. The main features are: Color, Shape, Coating, Texture.

APPLICATION

- The objective of the proposed work is to classify the tongue image into vata, pitta, kapha (tri-dosha) with the colour, coating, texture and shape features. These characteristics largely also would be determined by the portion of the tongue part (upper region, middle region and sides).
- The final outcome of the research is to blend in with the traditional Ayurvedic methods to the machine learning model in a way it describes the most basic class of inspection in medication.