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TONGUE BASED DIAGNOSIS SYSTEM USING NI-LABVIEW AND VISION ASSISTANT TOOL

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ABSTRACT

The Tongue diagnosis is a vital instrument used in Ayurvedic medicine for assessing a person's current state of health and for providing a basis for prognosis. Diagnostic technique informs the practitioner or doctor related to the human organs and the body systems. In this paper, different images of diseased tongues and a healthy tongue are analyzed using image processing tools of NI LABVIEW. Based on the variation of color on different portions of the tongue such as top, middle and bottom corresponding to vata, pitta and kapha respectively, standard deviation and mean values are calculated for each of these portions under RGB color plane extraction using NI vision assistant. Finally we present a comparison between standard deviation and mean values of a healthy tongue and a set of tongue images of diseased persons.

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Introduction

In olden days, tongue diagnosis was a non-invasive procedure for different traditional medical systems like Ayurveda Acupuncture etc. In modern medical science though tongue gets importance but up till now, no qualitative evaluation has been performed. In Traditional Medical Science, as mentioned above, TONGUE DIAGNOSIS contributes enormous importance, along with other traditional diagnostic criteria, not only in identification and evaluation of pathological conditions of the subjects as a whole but also very useful in assessment of the structural and functional status of different vital organ systems of the body.

In rural and urban areas people under poverty line suffering from different diseases can be easily diagnosed with low cost and portable model. The study aims to grab the colored tongue images of Normal and some selected diseased human subjects with the digital camera and subsequently transfer the images to the computer database for necessary Image Processing Pattern Recognition. This study will also try to develop diagnostic expert system in this regard.

Methodology

- Colour segmentation
- Mean standard value

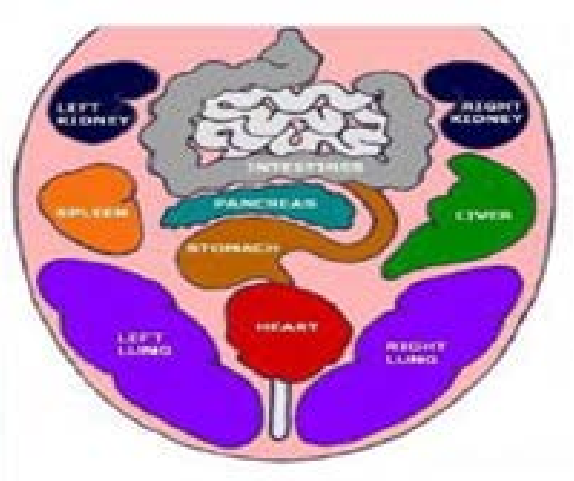

Figure 1: Representation of different parts of body on tongue

Figure 2: Tongue image

TONGUE DIAGNOSIS

In Vata, the tongue will be cold, rough and furrowed. In Pitta it will be red or yellow. In Kapha, it will be pale and sticky. In depletion of Tridoshas, the tongue will be dark with the papillae raised and dry.

Color of tongue coating:

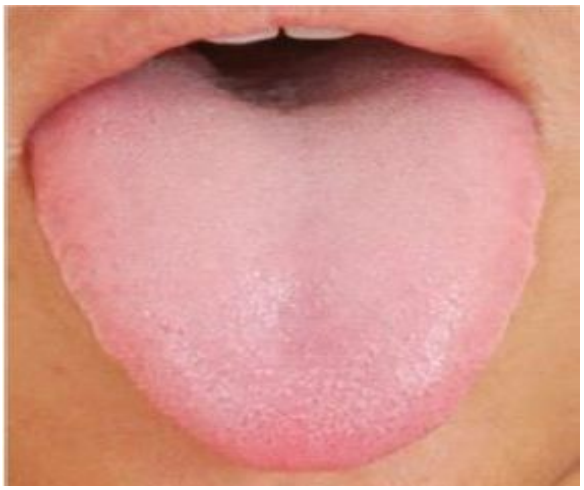

Figure 3: Healthy tongue

No coating: indicates a kapha imbalance. kapha imbalance is due to lack of fluids in the body. The tongue coating tells us about the fluids in your digestion specifically and, should there be no coating, we can assume that not only is there a deficiency of fluids in your stomach and intestines but elsewhere as well.

Figure 4: White coated tongue

White coating: normal and slightly cool and wet body environment Dirty white coating: cold internal temperature becoming hot. Cold becoming hot occurs when a common cold is turning into flu or a viral infection.

Figure 5: Blue coated tongue

Bluish coating: severe internal cold with blood stagnation.

Figure 6: Yellow coated tongue

Dirty Yellow coating: kapha and pitta organs stomach and small intestines are wet with heat.

Table 1: Excess of tastes damages the corresponding organs

Sr. No.	Excess of tastes	Effects
1	sweet taste	Obesity and sluggish, underactive thyroid
2	sour taste	pulmonary congestion
3	Salty taste	water retention and weakened kidneys
4	Pungent taste	burning sensations in the stomach and gastritis
5	Bitter taste	weakened pancreas, spleen and liver
6	Astringent taste	constipation in the large intestines

Sublingual Vein Extension on Underside of Tongue:

- Underside of tongue veins barely visible: Healthy, a good sign.
- Veins extend less than 50%: still a fairly good sign.
- Veins extend more than 50% up tongue: blood stagnation.

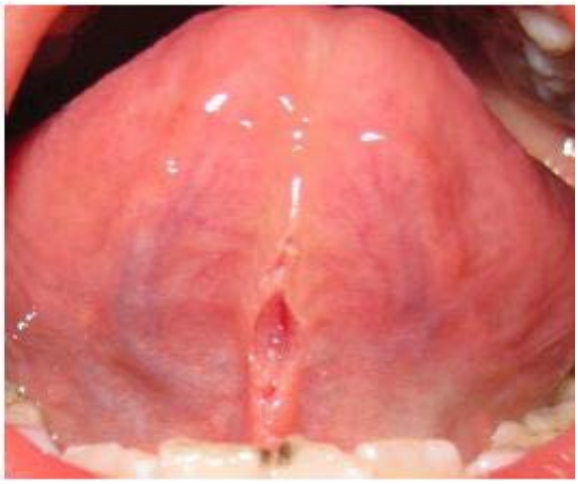

Figure 7: Underside of tongue for good sign

Figure 8: Underside of tongue for bad sign

Block diagram created in Lab VIEW using Color segmentation technique

- Go to Vision and motion>>Vision Utilities>>Image Management>>IMAQ Create
- Right click on Image Name & create constant & name it.

- Right click on Image Type create constant & choose RGB (U32)
- Go to Vision and motion>> Vision Utilities>>files>> IMAQ Read File
- Right click on **File Path** & create control
- Connect wire from **New Image** in IMAQ Create to Image in IMAQ Read File.

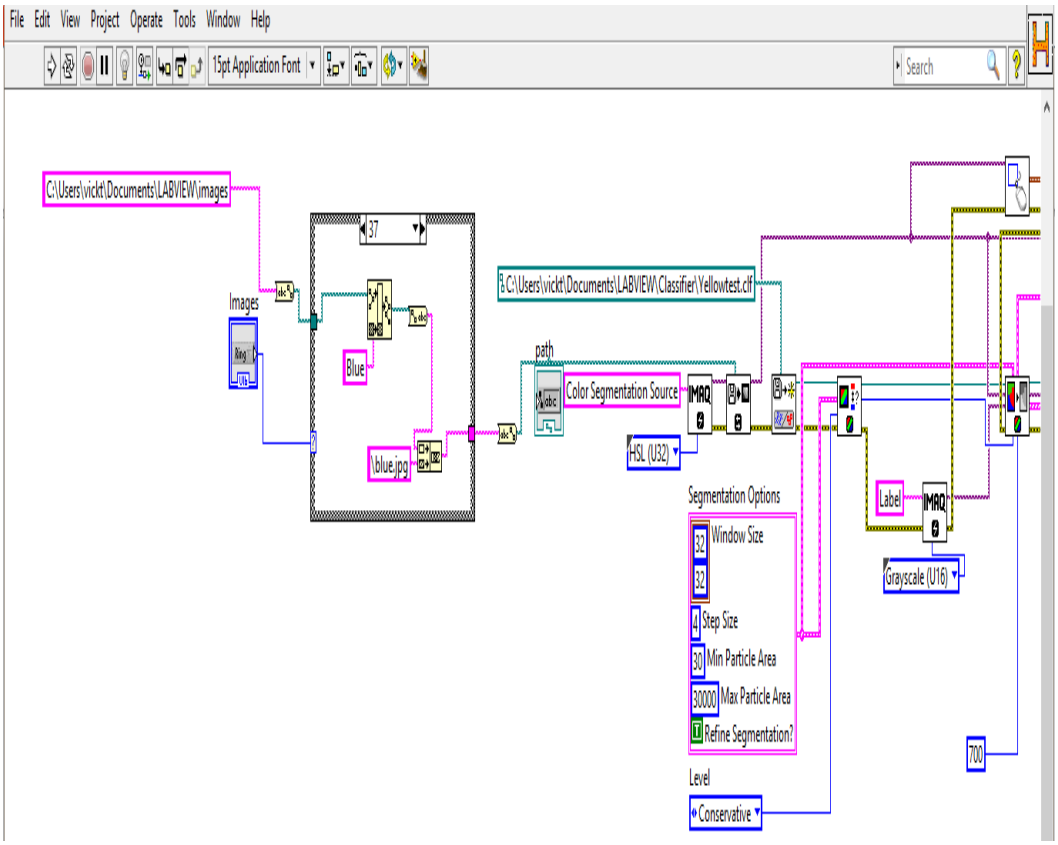

Figure 9a: Block diagram of Lab VIEW VI for Front Tongue

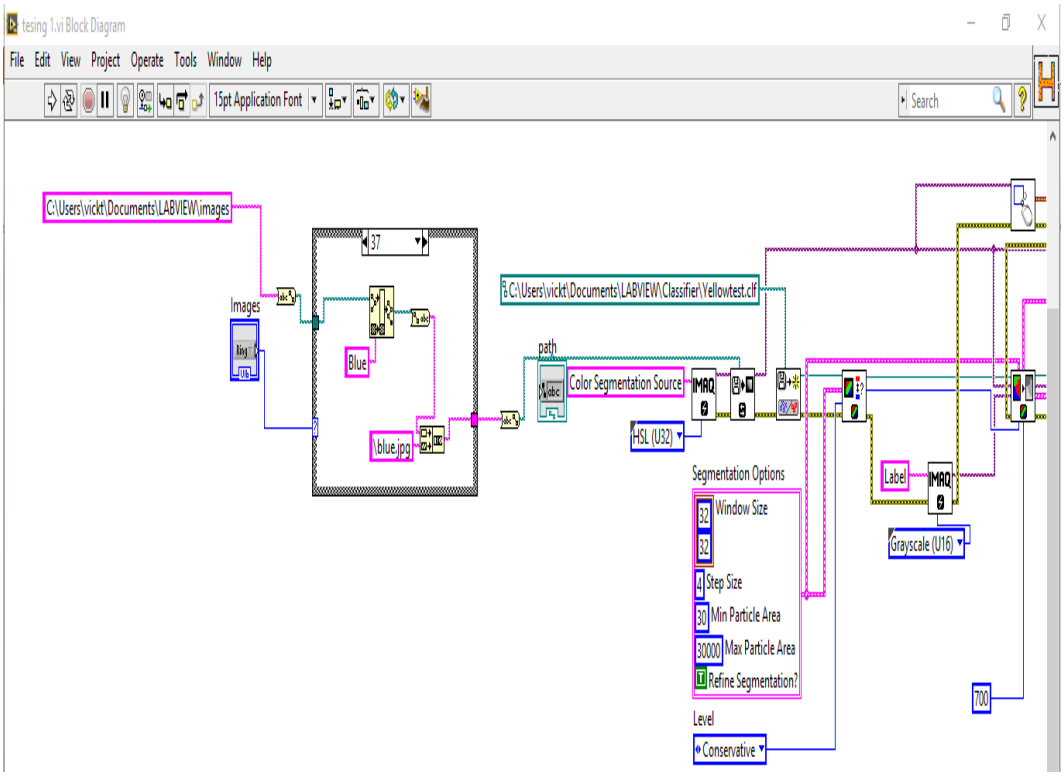

Figure 9b: Block diagram of last template of front Tongue

Front panel formed after Lab VIEW VI creation:

1. Go to vision<<image display(classic)
2. Browse the file path
3. Front panel is formed by having parameters such as image out box, paths as shown in fig 10.

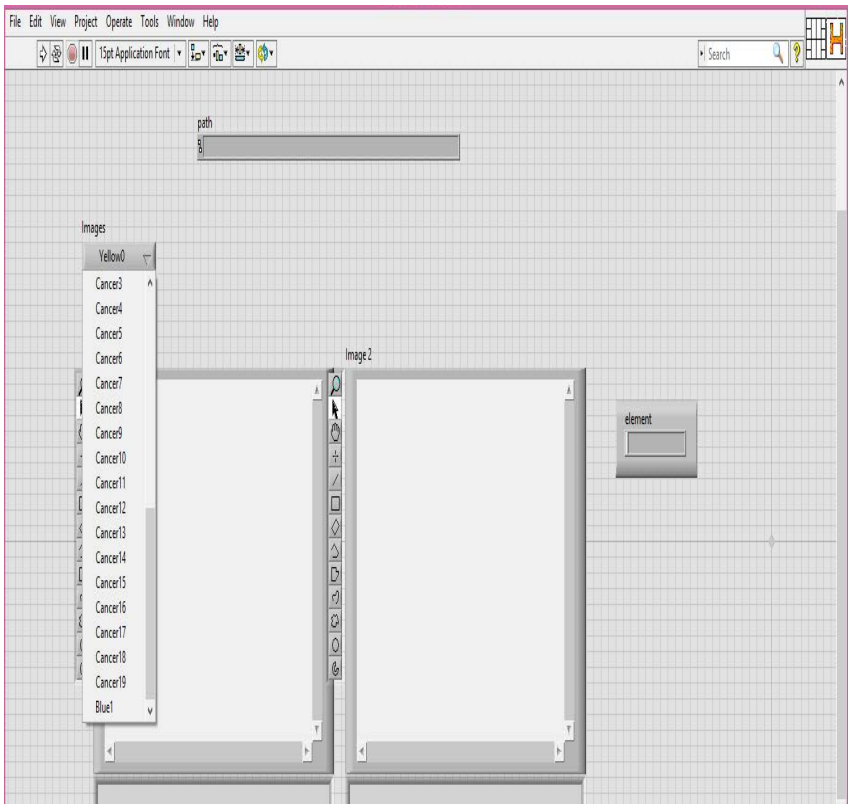

Figure 10: Front panel for front tongue.

4. Selecting the image before running the program on the control panel as shown in fig 11

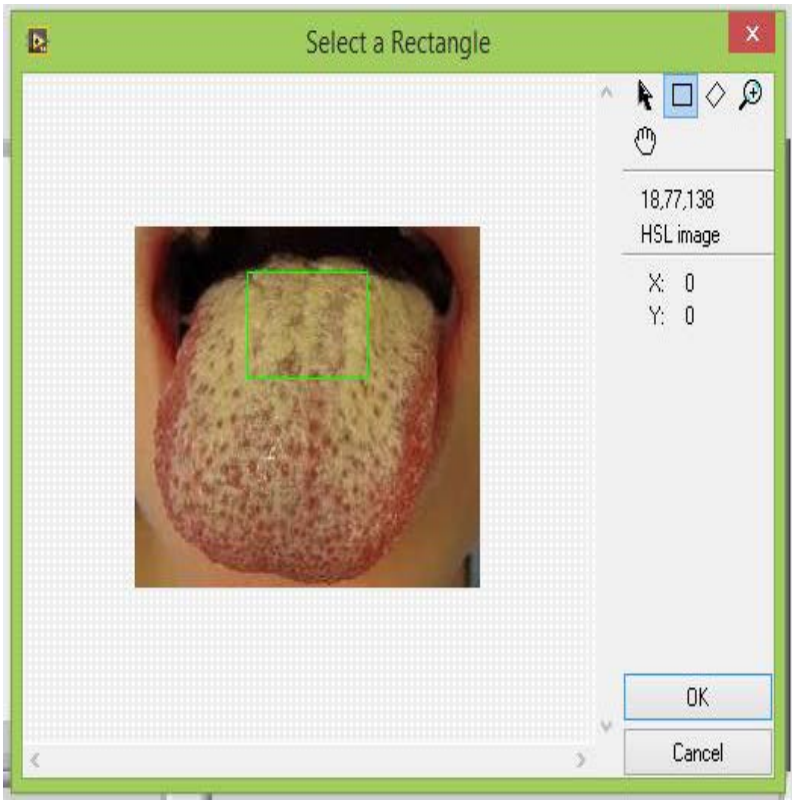

Figure 11: Selection of region on tongue.

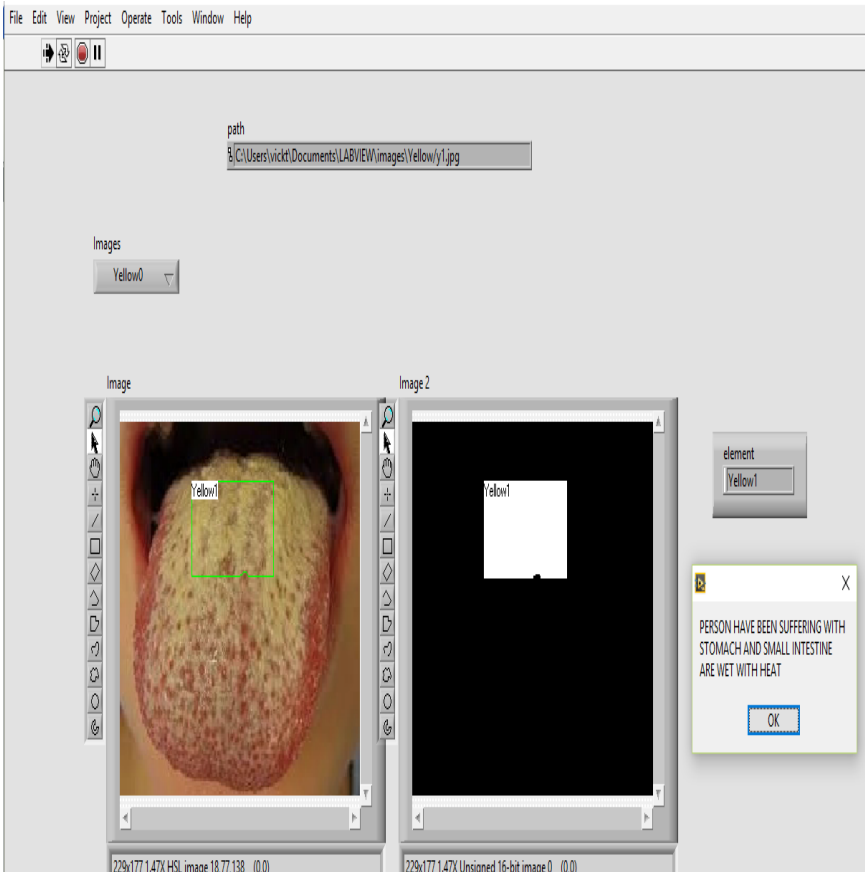

Figure 12: Output is a yellow coated tongue

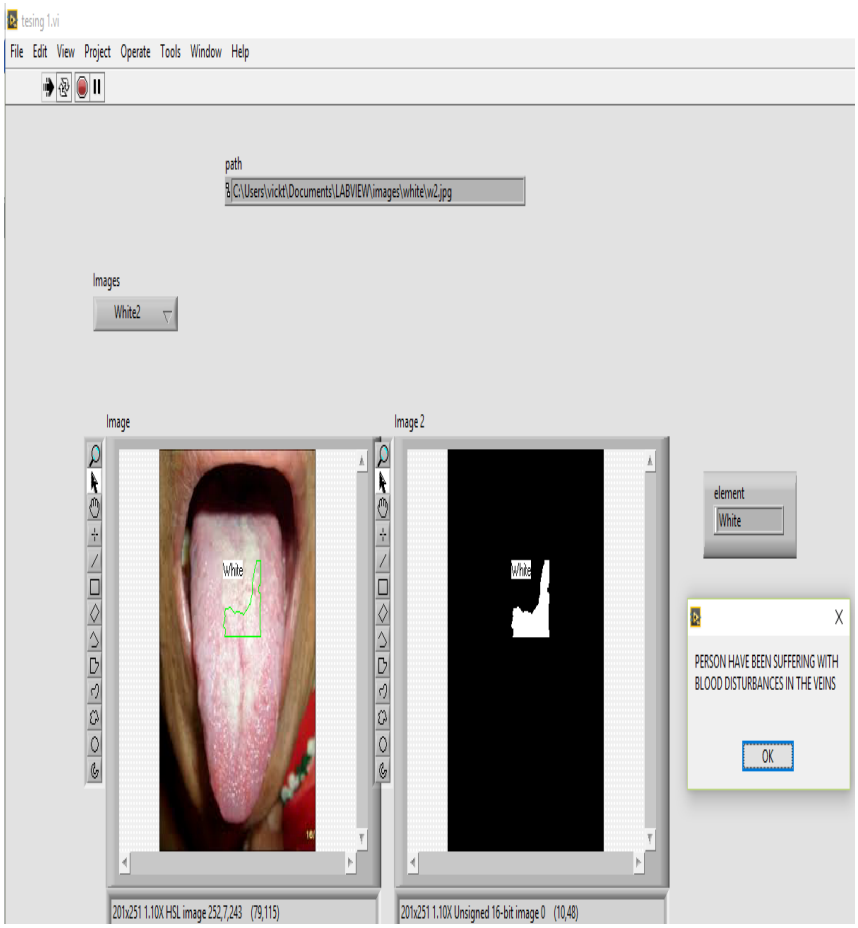

Figure 13: Output is a white coated tongue

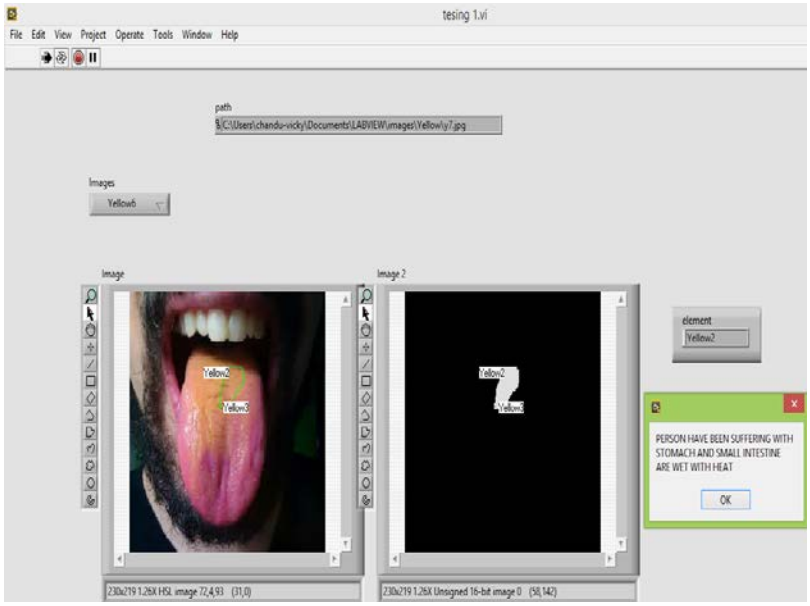

Figure 14: Output is a different tongue that is yellow2 & yellow3 color.

CALCULATION OF STANDARD DEVIATION & MEAN VALUES IN HISTOGRAM

Steps to implement in **block diagram** using lab view:

1. go to Vision and motion>>Vision Utilities>>Image Management>>IMAQ Create
2. Right click on Image Name & create constant & name it.
3. Right click on Image Type create constant & choose Grayscale (U8)
4. go to Vision and motion>>Vision Utilities>>files>> IMAQ Read File
5. Right click on File Path & create control.
6. Connect wire from 'New Image' in 'IMAQ Create' to 'Image' in IMAQ Read File.
7. go to Vision and motion>> image processing>>analysis>>IMAQ Histogram
8. connect ' image' of IMAQ Histogram to 'image out 'of IMAQ Read File
9. connect Histogram Graph of IMAQ Histogram to Waveform graph

Steps to implement in **front panel**

1. Go to vision<<image display(classic)
2. Browse the file path
3. Go to modern>>graph>>waveform graph

CALCULATING MEAN AND STANDARD VALUES USING VISION ASSISTANT TOOL

1. Click on this icon to open image
2. Select the image as shown in fig 15

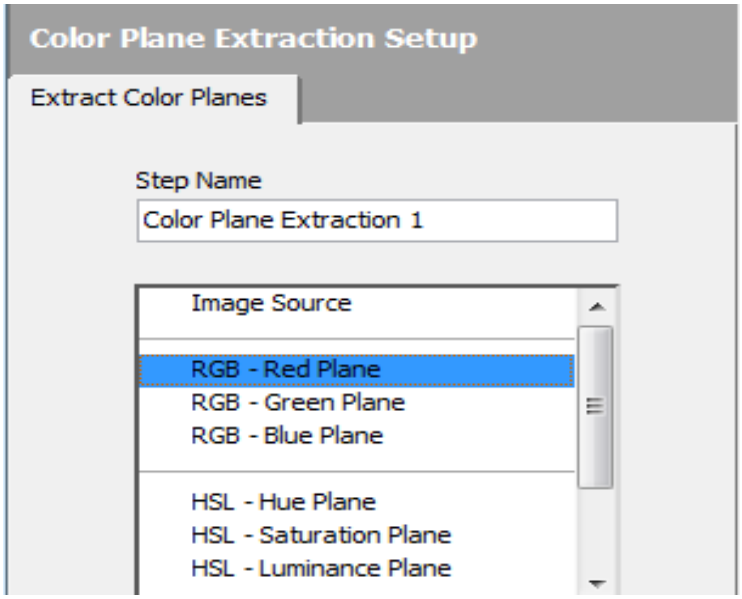

Figure 15: color plane extraction

3. Click on color plane extraction as shown in fig 16
4. Click on RGB-Red plane & then Click ok
5. Click on histogram
6. Note the values of standard deviation & mean using modes of linear and logarithmic

VATA

Figure 16: Upper part (vata)

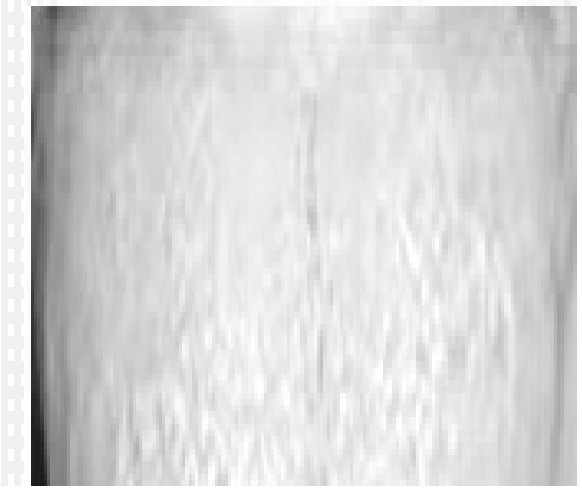

Figure 17: Color extraction

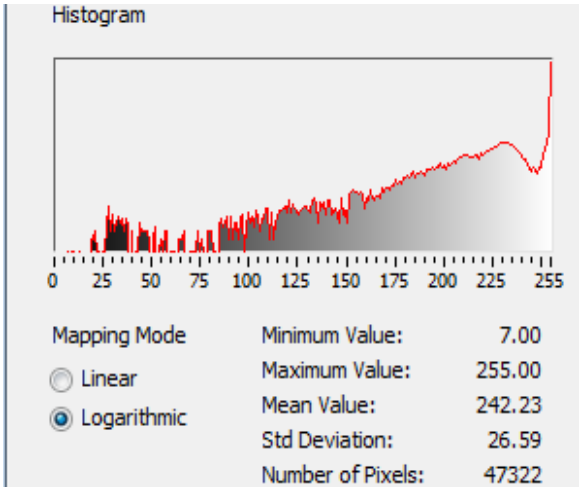

Figure 18: Histogram values

PITA

Figure 19: Middle part (pita)

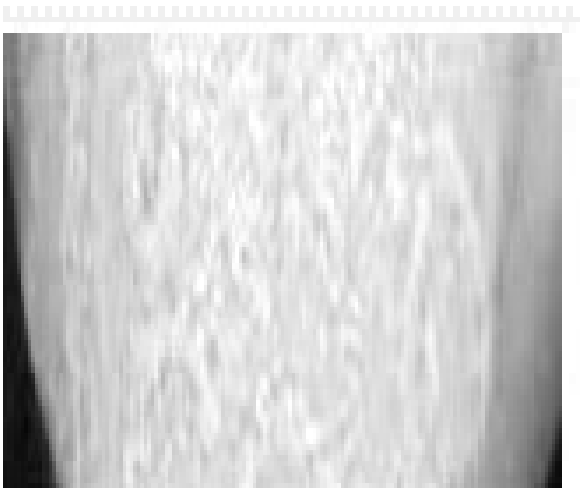

Figure 20: Colour extraction

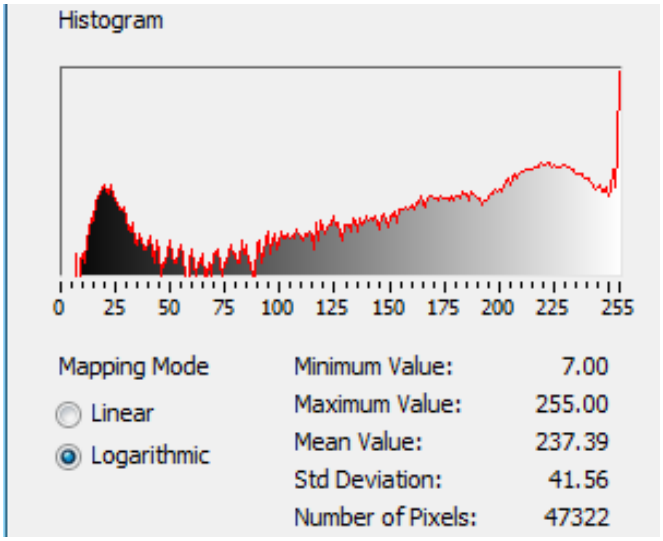

Figure 21: Histogram values

KAPHA

Figure 22: Bottom part (pita)

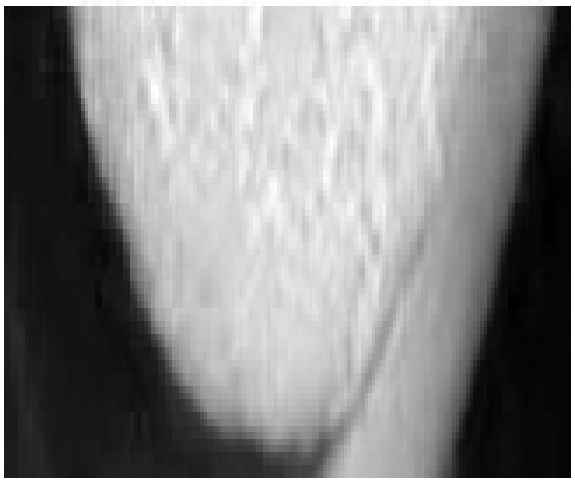

Figure 23: colour extraction

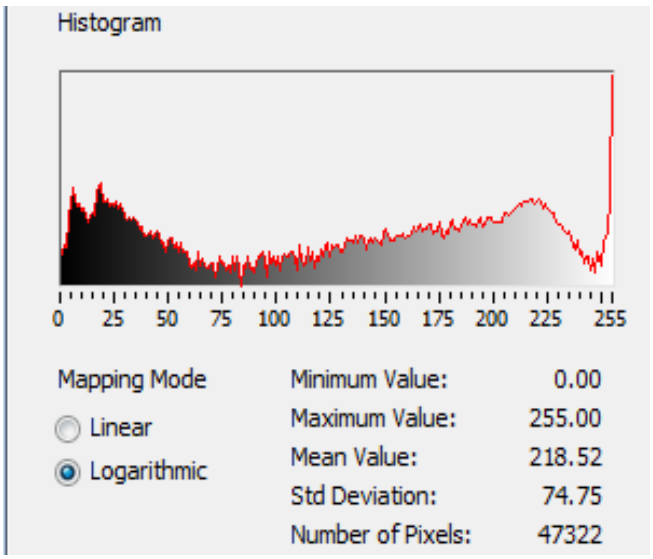

Figure 24: Histogram values

BLOCK DIAGRAM

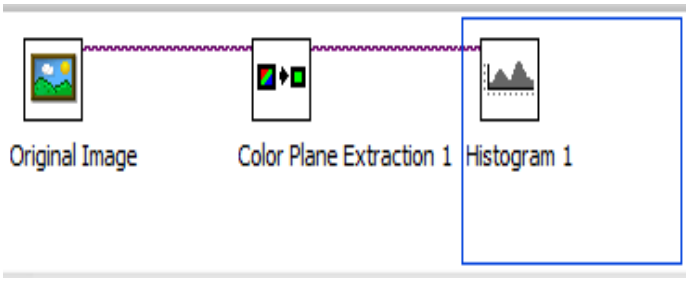

Figure 25: Block diagram of histogram

RESULTS

TABLE 2: STANDARD DEVIATION & MEAN VALUES FOR DIFFERENT TONGUE VALUES

S.no	Tongue type	Color plane extraction-RGB(red plane)					
		Standard deviation Value			Mean Value		
		Vata	Pita	Kapha	Vata	Pita	Kapha
1	Healthy tongue	18.85	18.85	15.7	219.62	219.62	220.25
2	Pancreatitis Diseased tongue	18.85	30.14	50.3	219.62	181.79	164.94
3	White coated diseased tongue	70.45	36.97	41.73	158.71	215.64	195.43
4	Yellow and blue coated diseased tongue	82.68	34.12	70.56	158.85	197.18	129.45
5	Geographic tongue	26.59	41.56	74.75	242.23	237.39	218.52
6	Diabetes mellitus	66.43	26.03	41.88	216.37	240.73	232.20
7	Appendicitis	60.53	47.02	67.54	215.41	227.35	214.30
8	Intestinal infarction-1	44.43	47.79	56.15	233.29	231.38	228.23
9	Intestinal infarction-2	66.83	47.39	60.09	208.76	222.39	216.45
10	Cholecystitis	76.80	49.60	50.78	201.50	220.67	220.61
11	Cerebral infarction	63.52	27.37	35.88	224.76	242.41	238.70
12	Blue coated diseased tongue	71.83	48.46	58.66	207.56	225.38	220.52

Here are the images of diseased tongues

Figure 26: healthy tongue

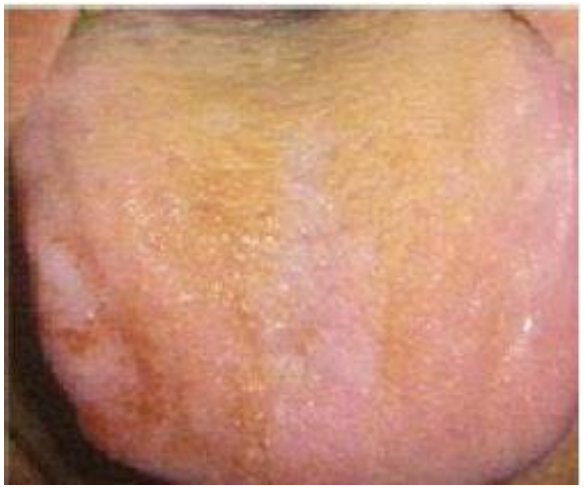

Figure 30: yellow coated tongue

Figure 27: pancreatitis tongue

figure 31: Whitecoated tongue

Figure 28: Yellow & blue coat

Figure 32:Diabetes mellitus

Figure 29: Cerebral infarction

Figure 33: Blue coated diseased tongue

In Color segmentation

The output of yellow coated tongue shows that the person has been suffering with stomach and small intestine are wet with heat.

The output of white coated tongue shows that the person has been suffering with blood disturbances in the veins.

The output of different tongue shown that the person has been suffering with heat in stomach and small intestines

In the Standard deviation calculation

The Highest value obtained is 82.68 in vata for Yellow and blue coated diseased tongue. The Lowest value obtained is 26.03 in Pita for Diabetes mellitus and closest to healthy tongue is Pancreatitis Diseased tongue

In the Mean calculation

The Highest value obtained is 242.41 in pita for cerebral infarction. The Lowest value obtained is 129.45 in kapha for Yellow and blue coated diseased tongue and closest to healthy tongue is Blue coated diseased tongue

CONCLUSIONS

This paper, for the first time, attempts to quantitatively evaluate the diseases of the tongue using NI **LABVIEW** and **VISION ASSISTANT.** The tongue's Mean and Standard values and Color Segmentation are one of the important research methods in the tongue image processing. In this, methods are provided to detect the white coating, yellow coating, blue coating and true color. From the evaluation of the results it is showed that the methods that is proposed gives the appropriate results to indicate the condition of the person related to vata, pitta, kapha along with tongue image and is well suited for the tongue image processing.

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