Pulse diagnosis System for *Nadi Pariksha* using parametric and statistical analysis

Amit Kadarmandalgi | Dr.Mythili Asaithambi | SENSE

INTRODUCTION

Nadi Pariksha (pulse-based diagnosis) is a non invasive method in Ayurveda by checking imbalance in any of three doshas i.e. vatha, pittha and kapha.

Prior systems for obtaining the Nadi pulses have been few and far between, when compared to systems such as ECG, microphone and pressure sensors using software like Labview. The pulse waveform is also shown to have the desirable variations with respect to age of patients with respect to various pulse parameters acquired at the sensing element.

The product i.e. electronic system design which consists of Photoplethysmography (PPG) sensor interfaced with Arduino which was used to acquire wrist pulse signals from subjects in the form of data sets. Matlab software was used in signal processing, feature extraction, parameters and analytics to determine the pulse pattern to check imbalance in *dosha.*
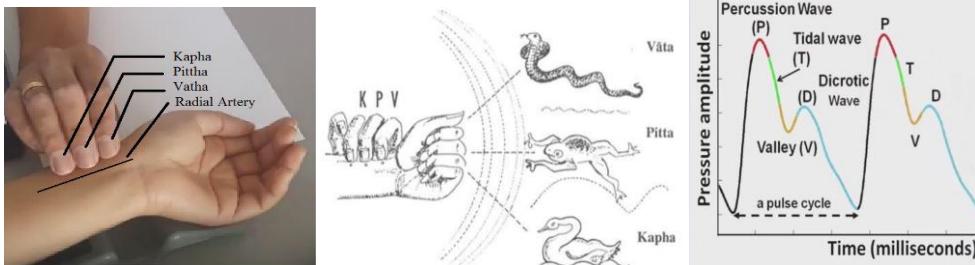

Fig 1. (a) Nadi Pariksha (b) Characteristics of *vatha, pittha, kapha* pulses (c) PTVD pattern of a pulse signal obtained from PPG sensor

OBJECTIVE

The product designed should help a doctor visually distinguish the dominant pulse to understand patient's condition.

The research part includes acquiring noise free signal and applying parameters related to PPG sensor such as pulse wave velocity (PWV), augmentation index (AI) & reflectivity index(RI).

After collecting the data sets for healthy people this standard signal can be used as a reference to check if there is deviation in *Vatha, Pittha, Kapha* dosha in patients with anxiety, rashes, and common cold respectively.

The research should help us in getting better results by comparing them to methods used in reference papers in similar line of work.

METHODOLOGY
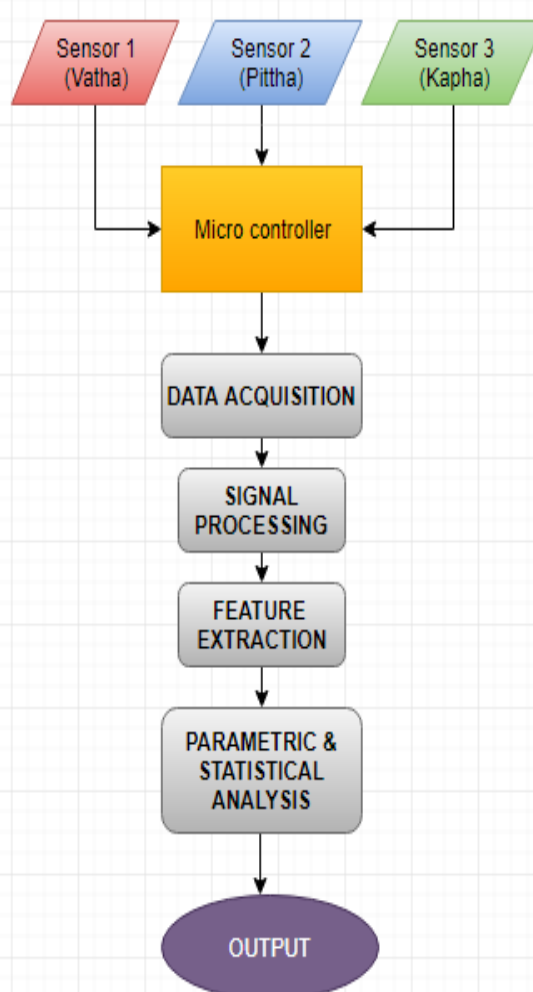
Data acquisition: *Vatha, Pittha, Kapha* pulse signal is acquired by positioning PPG sensors interfaced with arduino and matlab.

Signal processing: after performing a spectral analysis, in order to improve the quality of signal we have used downsampling, removing DC offset and designing a low pass Butterworth filter to remove noise from signal.

Feature extraction: detection of systolic and diastolic peaks of a pulse signal.

Parametric analysis: using the feature extracted mainly pulse wave velocity, reflectivity and augmentation index.

Statistical analysis: to derive a standard V P K signal obtained from finding average of data sets obtained from healthy people and then testing it by comparing those with unhealthy people.

Output: To check if signal obtained from patients associated with symptoms of vatha, pittha, kapha doshas deviate from the standard VPK signal.
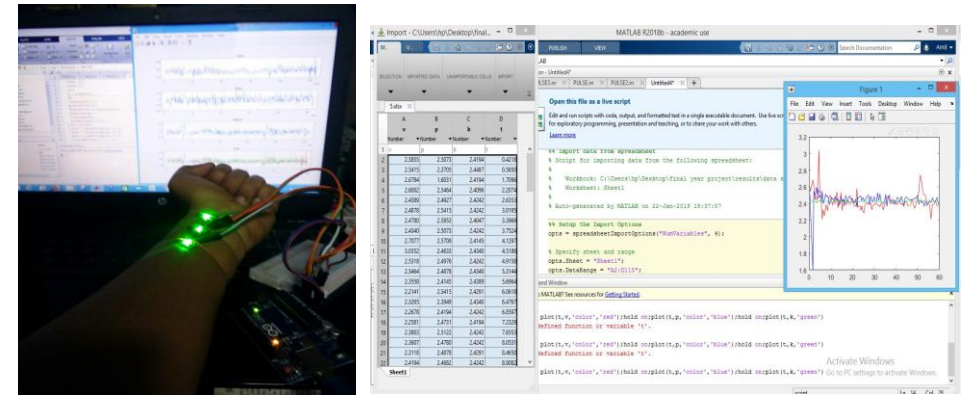
RESULTS AND CONCLUSION

Fig.2 Hardware Setup for data acquisition using Arduino and Matlab
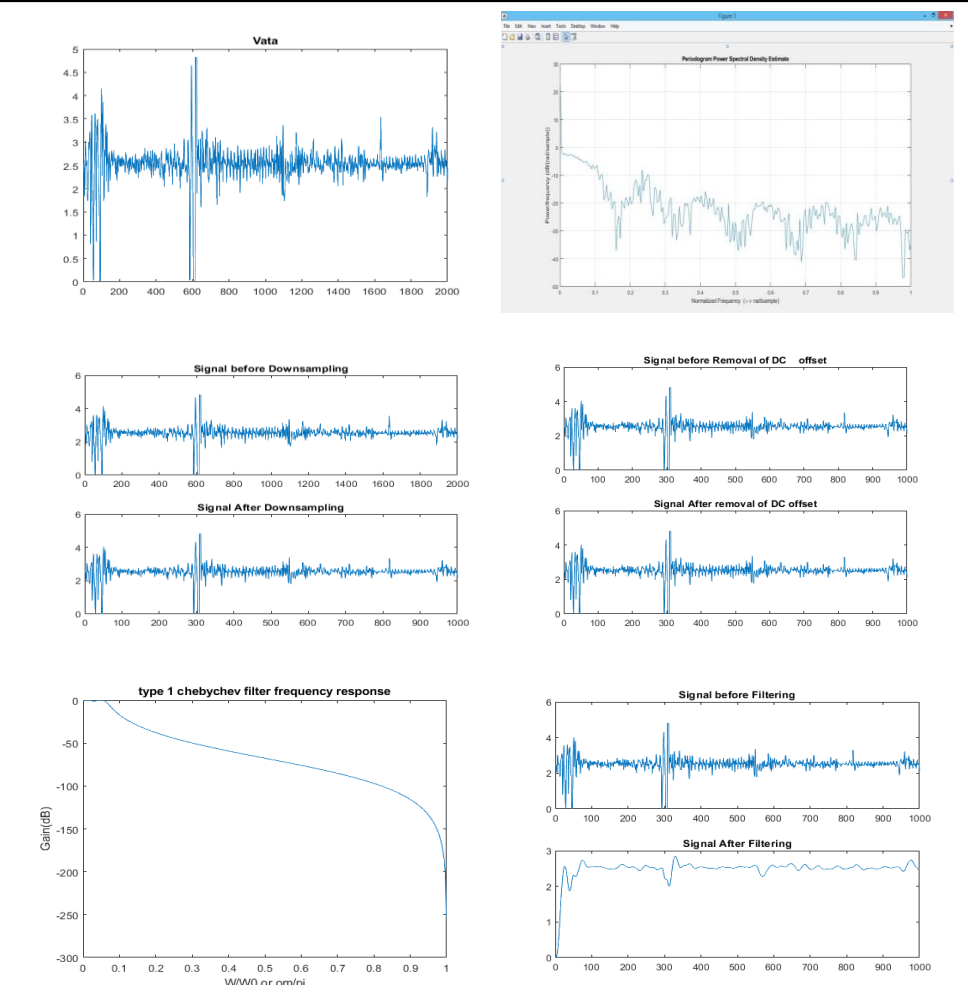

Fig 3.Pre processing: (a) Raw Signal (b) Power spectral density (c) Downsampling (d) DC offset (e) Low pass Butterworth filter (f) Signal after filtering
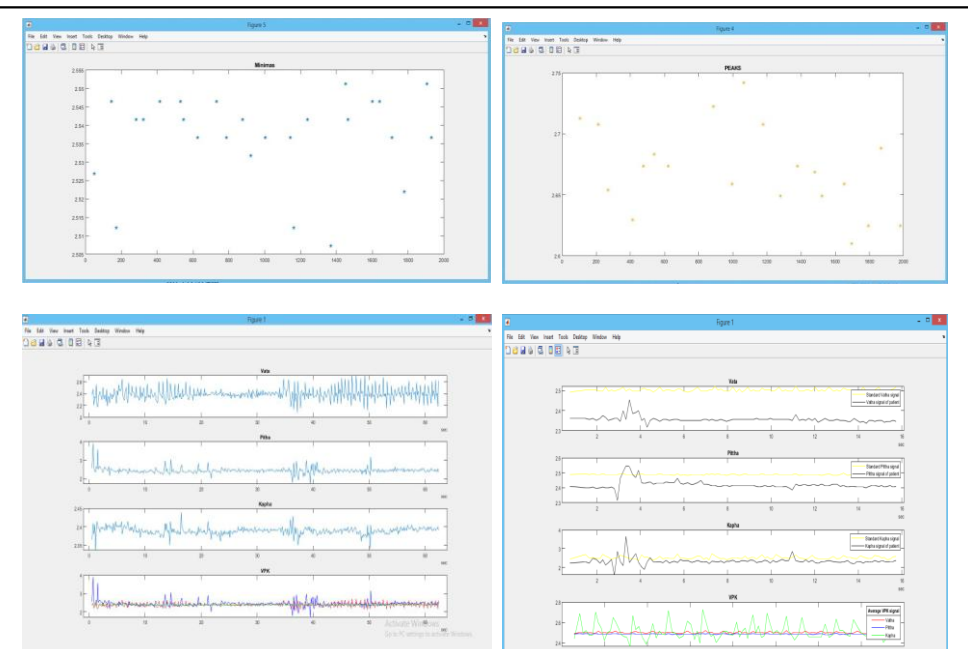

Fig 4. (a) Maximas (b) Minimas (c) Average VPK signal (d) Comparative analysis

CONCLUSION: Nadi Pariksha is a great skill used in ancient Ayurveda which is slowly being forgotten and considered non scientific. Hence this research focused on collecting large data sets with the right sensors to scientifically verify this skill. This paper not only attempts to achieve this to a great extent but also gives importance to approach involved designing algorithms and performing analytics. As a product we have achieved a new approach towards computer aided health diagnosis tools. Most of the results obtained satisfied the theoretical results.

Contact details: Amit K (15BEC0146) amit.kadarmandalgi1997@gmail.com Ph: 9448410286/9003566627