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NON-INVASIVE METHOD FOR DIABETES DETECTION USING NADI PARIKSHA AND ANN.

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Abstract— In this work, a non invasive technique is proposed to detect diabetes from tridosha analysis. This system uses three piezoelectric pressure sensors for Vaat, Pitta and Kapha signals respectively. These three signals are then amplified and filtered using signal condition unit. Along with tridosha analysis, artificial neural network (ANN) is used for classification purpose. An ANN takes typical features extracted from signal as input.ANN is trained using back propagation algorithm to minimize the error Features are related to amplitude and frequency variations. This system effectively uses knowledge of ayurveda for diagnosis of diabetes.

Index Terms—Artificial neural network, diabetes, piezoelectric pressure sensor, tridosha analysis.

I. INTRODUCTION

The present methods that are adopted for diabetes detection are invasive. These methods involve collecting blood sample from patient followed by some chemical analysis. For pulse acquisition doctor uses three fingers starting from index finger middle finger and ring finger as shown in Fig.1.These three fingers represent three doshas i.e. Vaat, Pitta & Kapha of the Nadi. The index finger represents the Vaat prakriti, middle finger represents Pitta prakriti and ring finger represents Kapha prakriti. Since these three pulses have different pulse rate it is difficult to hear or feel three distinct pulses simultaneously. The energy imbalance in the three pulses is detected by analyzing the pulse rates. And depending on which, prakriti of human being is predicted.

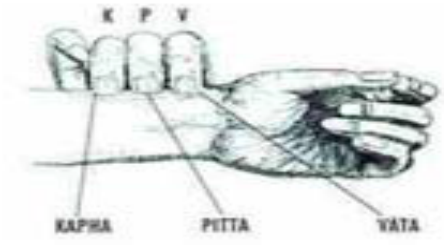

Fig. 1 Standard positions to obtain pulse

The predominance in any single or combinations of the doshas, human is classified into specific disease category.

II. PROPOSED SYSTEM DIAGRAM

In this work, human wrist pulses are captured using three pressure sensors as shown in Fig.1, which works on the piezoelectric principle.

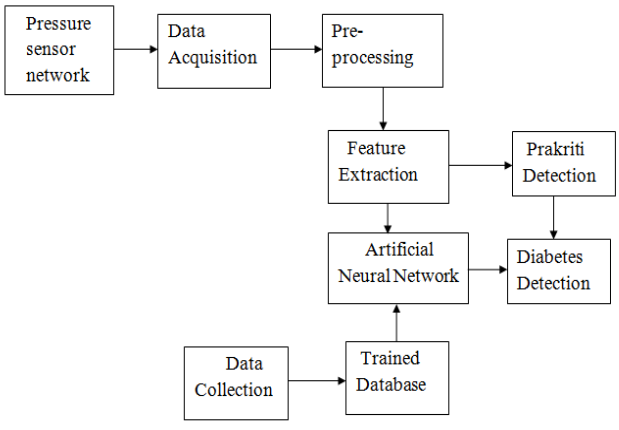

Fig. 2 Block Diagram of System

A. DATA ACQUISITION AND PRE-PROCESSING.

The nadi pulses are sensed by the fingertip, which actually measure the pressure exerted by the artery. These pulsations

are very minute in pressure units and therefore their acquisition is very challenging.

The electrical signal proportional to the pressure obtained from sensing element is then amplified and filtered using series of amplifiers After amplification, data is acquired using NI USB-6210 multifunction data acquisition card having an interface with the personal computer

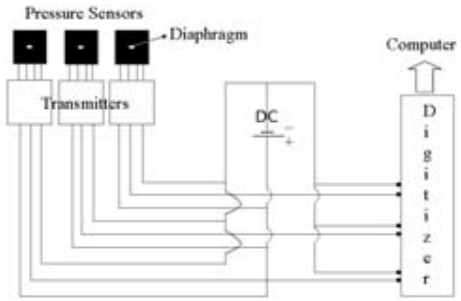

Fig.3 Line diagram of pulse diagnosing system Sensor

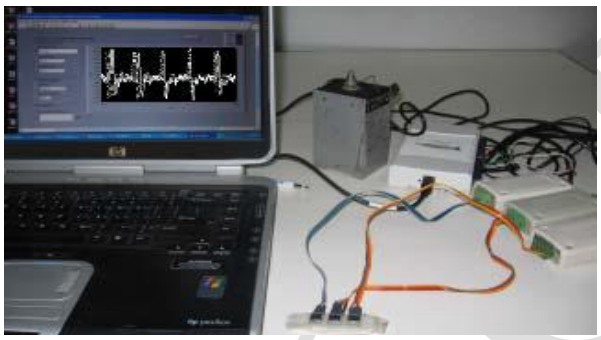

Fig 4.Complete Set up

B. FEATURE EXTRACTION

Acquired signals are exported in MATLAB using load command. Time and frequency domain features are extracted using digital signal processing techniques. Features such as amplitude of R peak and QRS section are extracted as shown in Fig.7 The process of QRS detection involves signal processing operations such as filtering ,differentiating and squaring of signal.

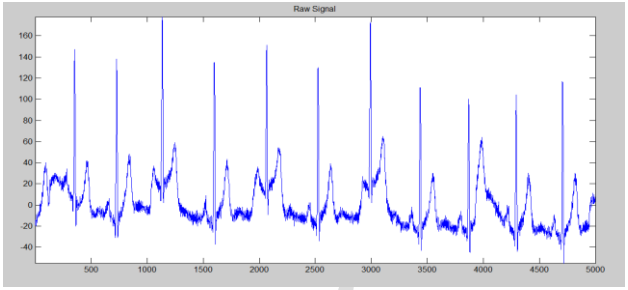

Fig 5. Raw Signal

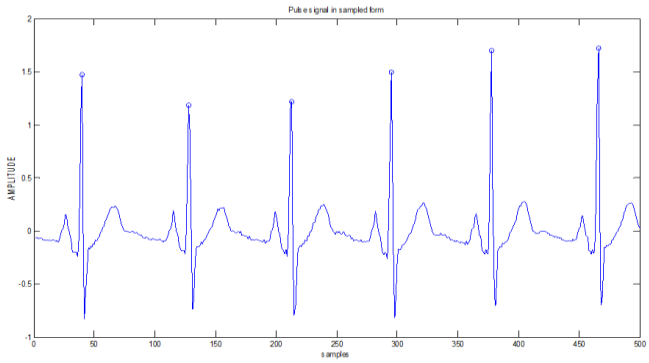

Fig 6. Peak Detection results

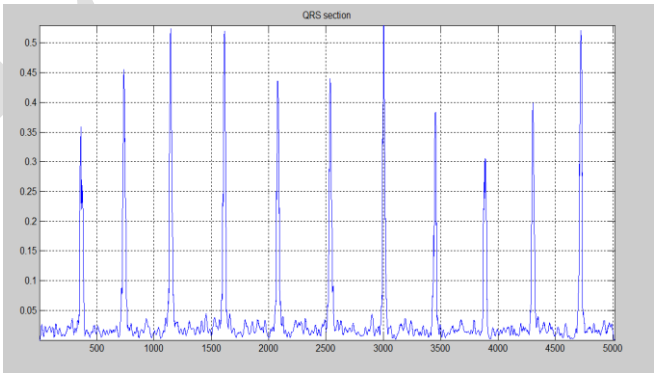

Fig.7 QRS detection result

C. DESIGN OF ANN

The features extracted from the signals are used to train the neural network.

Back propagation algorithm is used to get minimum error in classification.

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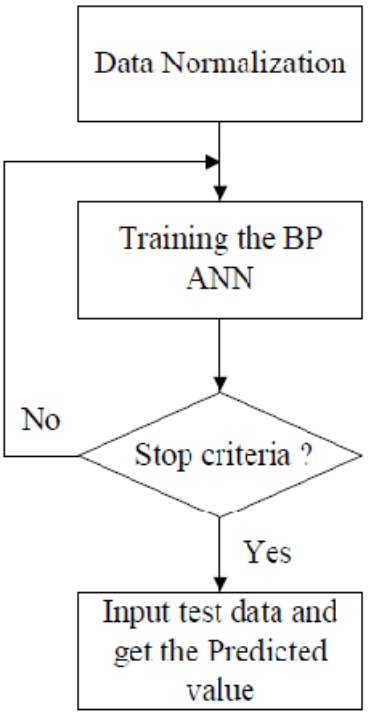

Fig. 8 Flow of ANN design

III. CONCLUSION

A non invasive diagnosis technique is implemented for diabetes detection. This system will be used to detect diabetes using two methods, tridosha analysis (ayurveda diagnosis) and ANN as soft computing tool. Also a real time PC based system is developed which allow user to check his/her prakriti at any time based on heart rate variability. Furthermore, a back propagation algorithm based ANN is designed to classify the signals for further diagnosis.

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