Nadi pariksha: IOT-based patient monitoring and disease prediction system

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Abstract. Nowadays, peoples are suffering from different types of diseases and detection tests for these diseases are costly and it is painful for poor people. In Ancient, Nadi Pariksha is the supernatural technique to recognize the health status of the patient and to approximate the quantity of Tridosha i.e. Vata, Pitta and Kapha in the body which are helpful for detection and diagnosis of diseases. The main aim of this paper is to propose IOT-based pulse examination system which is used to oblige doctors in diagnostic practice for prediction of diseases.

1. Introduction

According Ayurveda, any kind of components present in the nature, same elements discover in the smallest part of the human body and vice versa. Ayurveda said that there are five components available in the nature i.e. earth, water, fire, air and space which controls the body by means of three Dosha’s called as Tridosha[1][4][8]. Nadi Pariksha is used to recognize the health status of the patient and to approximate the quantity of Tridosha i.e. Vata, Pitta and Kapha in the body and are considered the basic components of health and the steadiness between these components called as good health and instability called as ill. In ancient, vaidya (doctor) inspect Nadi (Pulse) at right wrist of the male and left wrist of the female for detection and diagnosis of diseases[1][2].

Tridosha’s, Vata is combination of air and space and pass on sensational input from the numerous organs to the brain. Pitta is a combination of water and fire and superintends for digestion, vision and skin complexion. Kapha is combination of water and earth and come up with moistness and lubrication, strengthening and stability. These three pulses are of different in characteristic. The vata pulse, pitta pulse and kapha pulse has characterized as snake like motion, jumping like frog and floating like swan respectively[1][8].

Nadi is a waterway within the body in the form of blood vessels and the term Nadi Pariksha indicates the examination of pulse and the absence of pulsing denotes death. The method of Nadi Pariksha includes placing of vata (index), pitta (middle) and Kapha (ring) finger on forearm[1][2][8] as shown in fig. 1 and the pressure of pulse on three represents illness.
In Ayurveda, there are three ways of examine to predict the disease. At first, by perceiving patients physical signs and symptoms called as “Darshana Pariksha”, at second, to interrogate regarding the instability called as “ Prashna Pariksha” and at last, to come in contact with the patient called as “ Sparshna Pariksha” and the pulse diagnosis are the part of this which can inform about the exact location and the nature of disease. In this paper, our main aim to propose a system for patient health monitoring and disease prediction based on pulse diagnosis using IOT [1][2][8].

The rest of the paper is arranged as follows: Section 2-write up the related work in IOT in pulse diagnosis. Section-3 demonstrates the proposed methodology. Lastly, a conclusion is written in section-4.

2. Related Work

Traditionally, an Ayurvedic doctor is to check out the radial pulse using the three fingers for the diagnosis of diseases [4]. In research, IoT and machine learning in healthcare has covered a large area and existing works provides an opportunity to concentrate for the extended or the future scope[5].

Chaudhari et al. [8] has designed IOT based system using photoelectric sensors for nadi diagnosis in which the signal noise is removed by designing the Butterworth filter. The main objectives of this paper have to sense the pressure pulses for diagnosis and the parameters used for detection of disease such as blood volume and blood viscosity. The tools used for analysis of data such as LabView and Matlab for feature extraction and power spectrum.

Roopini et al. [4] has designed a system with three optical sensors which are placed on radial artery for pulse signal analysis in which the signal noise is removed by designing the Butterworth filter. The tools used for analysis of data such as LabView and Matlab for feature extraction and power spectrum and acted as a portable wearable device for home based health monitoring.

Jie Wan et al. [5] has designed a health monitoring system WISE which adopts body area sensor network framework for real time monitoring of the patients and allowed to access the information from cloud.

Ayesha Masood et al. [3] have designed a health monitoring system and the main objectives of the system to associate a real time communication between physician and patient. It is patient screening system which is used to observe the patient remotely for detecting the symptoms and has given the guidance for medical diagnosis. The system used to transmit the scanned data via internet to the ThinkSpeak platform using the built-in Wi-Fi module.
Kalpana Kachare et al. [1] has discussed nadi pariksha is a tool for faster diagnosis as compared to the other system of medicines and also to improve the knowledge over pulse examination. The author also gave more stress to use knowledge of Nadi for reaching the height

3. Proposed Methodology
Proposed block diagram of Nadi Pariksha for pulse diagnosis[2][3][4][5][8] as shown in fig. 2. Figure represents the flow of disease detection. The flow starts from the patient authentication i.e. all the details of patient has been registered.

![Proposed block diagram for disease prediction system.](image)

After registration, pulse sensors are attached on the wrist of the patient which are used to encompass the pulse signals from the patient. After collecting data, the data are securely fetched for pre-processing on cloud and after pre-processing, the classification algorithm has been applied for validation.

3.1. Patient with Authentication
This is the first step of the proposed methodology, in which access is given to only authorize users. To maintain secure authentication, proposed methodology will use hashing techniques. This phase focuses on registration, login and verification [3][8].

3.2. Secure Data Transfer
The data sensed by the pulse sensor and fetched by the IOT kit towards the health care application. In the proposed work, pulse sensed data of the patient are encrypted using hospital Id and securely transferred to the cloud by any secure encryption algorithm [3][8].

3.3. IOT Kit
In this phase, the sensor is attached to patient’s forearm to sense the data and the task of the IoT kit to receive the sensed data. The kit receives the data in hexadecimal form and then converted into binary form. After that the data is securely transmitted for pre-processing [3].
3.4. Pre-processing
Pre-processing includes three steps replacing of missing attributes, removal of redundancy and normalization. The pulse signals which are acquired, it’s necessary first to pre-process them. At the time of acquiring pulse signals, they contain noise by interacting with the skin and muscles [3][8].

4. Conclusion
This paper presents a design of Nadi Pariksha, a system for patient monitoring and disease prediction based on pulse diagnosis. The proposed system has designed with pulse sensors which are placed on forearm to receive the pulse signals. In future, the system has been used for data collection in real-time and the collected data has been securely transferred and classified based on the feature extraction. This system will help doctors for prediction of disease and better diagnosis.

5. References
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