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Hand: Health Analysis using Nadi Detection – A Pervasive Approach

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I. INTRODUCTION

In modern world the chronic diseases like cancer and its types, diabetes, obesity, heart strokes etc are much dependent on surgical treatments where the analysis is done only after scanning the body, X-rays or through the medicinal tests by pills. But in ancient India, the saints also called as Vaidyas used to analyze the condition of human body by understanding and reading the Nadi which is nothing but the human pulse.

Nadi Vaidyam is an ancient Indian Ayurveda methodology for diagnosis through the human pulse. Through this nadi vaidyam, Vaidyas understand accurately both the physical and mental condition of the human body and its imbalances very precisely. It not only identifies the symptoms but also finds the root cause of health issues. Nadi Vaidyam prewarns about potential health hazards. It gives an insight for enhancing the human health in accordance with the elements which are prevailing in body. Various dreadful diseases like cancer, obesity, infertility, diabetes, paralysis, hypertension, mental disorders, skin diseases and severe joint pains can be detected by this Nadi Vaidyam[1].

In ancient days, Vaidyas used to know the condition of the body just through the pulse of the human being and they were succeeded in treating the people. As the days passed on, the usage of pulse diagnosis has become almost to an end. The benefits of this are accuracy, faster, efficiency, future prediction, money savior and no pain for scanning, blood test etc., The modern technology which is more dependent on the surgical treatments on the body may not cure the root cause of the disease. The disease can be cured if it is known in early stages of attack. Technology should provide the services that help the common people to live happily for long tenure. People usually want to be in their place and be independent for as long as they can [2]. It is thereby essential to develop a device that provides the health condition of the person very accurately and quickly without consulting the doctor.

Nadi Vaidyam can detect energy blockages through pulse points and through which one can understand what the problem is. The best time to check the pulse is in the early morning, physiologically the least active time of the day. Three fingers are used to check pulse points, the middle, index, and ring, with the index finger placed closest to the wrist crease. At first, the three positions are palpated simultaneously, initially, lightly, then with medium pressure, and finally more strongly. After this, each position is checked separately. Different systems are used whereby the pulse at each position is identified with certain organs. When the pulse is taken, attention is given to the frequency, amplitude and quality of the pulse. A normal pulse is distinct, discernible to the fingertip upon medium pressure, and can still be palpated with the application of heavy pressure.

II. RELATED WORK

Nadi Vaidyam is the effective traditional method of diagnosing the innumerable dangerous diseases. Analysing and observing the patterns of Nadi plays a vital role in medicating the disease through proper channel. Various types of diseases can be detected in the very initial stage by understanding the human pulse. In general Nadi can be explained as any channel for the passage of physiological and biological waves like pulse, nerves, veins, arteries etc., the main aim is to reduce the major effects of dreadful diseases by finding the root cause of it in very tender stage.

According to Nadi Aridhal[3] A pulse is a waveform and generally known for important time domain features: tidal wave (T), dicrotic wave (D), valley (V) and percussion wave (P). Usually the waveparts must present in a standard pulse waveform with the proper amplitude and duration of time taken to show whether the functioning of the heart and other body organs are in proper. Variations in amplitudes, the rising & falling slopes, systolic & diastolic energies, velocities, and so on can be observed by the pulse.

Nadi Parikshan Yantra[4] is used for collecting the pulse data. This Nadi Parikshan Yantra is portable. It has three identical data acquisition channels to acquire pressure data at three pulse points - vata, pitta and kapha. This simulates the three fingers of NadiVaidya. These sensors are placed on wrist using Velcrow tape. The Three sensors are further connected to three identical data acquisition channels through coaxial cables. The pulse data acquired is displayed on the PC screen on three different channels.

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By using the different patterns of nadis, Nadi Vaidyam measures the parameters like the commonly observed respiratory rate, pulse rate, rhythm, and pressure of blood flow, electrocardiogram (ECG), echocardiogram, etc., or the special experimentally investigated parameters like elasticity and rigidity of arteries, muscle tension, bioelectrical potentials.

In general, when human health is not in good condition, it automatically gives out certain alarms such as easy fatigue, body aches, headaches, lack of appetite, depression, anxiety, stress, fear, bad temper, palpitation, dizziness, etc., people in these states are determined to be in sub-health condition. Now no longer to use Ultra-sonic, nuclear magnetic resonance or radiography in helping clients target their health conditions.

A. There are Various Devices presently using for Pulse Diagnosis. Few of them are

1) Quantum Magnetic Resonance Analyser
2) Digital Meridian Sensor/ System
3) Computer Meridian Diagnostics
4) Veda pulse
5) Electro tridoshagraphy

B. QMRA: Quantum Magnetic Resonance Analyser

This was developed based on the study of a hundred million clinical cases over a period of many years. Accuracy of getting the correct information is 85%. The human body is an aggregate of numerous cells, which continuously grow, develop, split, regenerate and die. By splitting the cells renew by themselves. Here in this process, charged bodies of nucleus and extra-nuclear electrons as the basis unit of a cell, are moving and changing ceaselessly at a high speed as well, emitting electromagnetic waves without interruption.

These electromagnetic waves emitted by human bodies represent the specific condition of human body and therefore, different signals of electromagnetic waves will be emitted by the condition of good health, sub health etc. This analyzer collects the weak magnetic frequency and energy of human body by holding the sensor, after amplification by the instrument and treatment by the built-in microprocessor the data are compared with the standard quantum resonant spectrum of diseases, nutrition and other indicators incorporated in the instrument to judge whether the sample waveforms are irregular using Fourier approach.

Analysis and judgment can be made on health conditions and main problems of the tested person based on the result of waveform analysis. Cardio-vascular, Cerebro-vascular conditions, bone mineral density can be known. Only with 10 or so cells of pathological change, the analyser can capture the changes of cells and predict the pre-occurrence of diseases.

C. DMS: Digital Meridian Sensor/ System

Digital Meridian System is a sub health measurement system based on traditional Chinese medicines. It completely used 12 Meridian Theory, combining with Information technology. An Electronic Digital Meridian Sensor attached to a personal computer is used to measure and process the meridian energy values released by the meridian acupoints from both the hands and legs. These meridian values are then uploaded to Digital Meridian System's Data center will profile, analyze and match the energy values against the millions of data to generate a Digital Meridian System Sub Health analysis report.

D. CMD: Computer Meridian Diagnostics

CMD is a revolutionary health-check system that is now available to the general public for the first time. The system from which it is derived was developed at huge cost by a team of Russia's leading space scientists. That system has been used with great success in protecting the health of cosmonauts during lengthy journeys in space.

The body is its own best physician. It signals when something is not as it should be. Chinese physicians were aware of these thousands of years ago. They knew that any illness could be traced to an imbalance in the body's energy systems. Correct the balance, and cure the illness. CMD can detect those warning signals. It enables anyone with an ordinary PC or laptop and Internet connection to measure their body's vital energy and get an immediate indication of their state of well-being -- painlessly, and without visiting a doctor. Measurements are taken using a special, easy-to-use sensor provided to all CMD members.

These measurements are then sent, via the Internet, to the central CMD-Server in Germany, where the readings are compared with data collected from people of the same age and gender in various states of health. More than 12 million such measurements are

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stored in a CMD database that is constantly being expanded. Evaluation takes only seconds, and the results are displayed on the member's computer screen. The entire health check procedure can be done in less than three minutes. Members may take an unlimited number of readings, even daily, and send them for evaluation, thereby building a health profile that will reveal trends and patterns.

E. Veda Pulse

Veda Pulse is a hardware and software kit for performing pulse analysis and creating an individual rehabilitation program based on naturopathy. Veda Pulse is an expert system that allows a health consultant to perform an express test of functional state of the body, evaluate stress level and help provide individual recommendations for rehabilitation including diet, food supplements, aromatherapy, herbs and correction of lifestyle.

Veda Pulse allows mastering pulse analysis in the shortest period of time and putting it into practice. In order to use the device you need either basic medical education or some Ayurvedic knowledge or knowledge of any other traditional health system (reflexology, herbal therapy, diet therapy, homeopathy and others). Electrical and mechanical occurrences happening in the heart create external characteristics of the pulse wave. Veda Pulse analyses the heart rate using mathematical methods. It allows estimating functions of particular organs and systems, as well as the patient's health status in general.

F. ETG: Electro Tridoshagraphy

Electro tridoshagraphy technology, which is also called ETG Ayurveda Scan system is the only and single scanning system. ETG Ayurveda Scan scans whole body by ETG machine. The Data is transferred to Computer software and thus computer generated report is produced. It quantifies the Status of the Ayurvedic principals i.e., Prakruti, Tridosha, TridoshaBhed, SaptDhatu, Mal, Agni etc.

Diagnose the disorders of the whole body and measures the intensity of the vital organs and systems with their fitness / sickness in view of Pathophysiology or Pathology. On the ground of the findings of the ETG AyurvedaScan a patient is treated with accuracy and confident by Ayurvedic medicines. The development of this system is totally based on the principles of ayurveda and has no any link or relation to Modern western medicine / Allopathy.

III. PROPOSED WORK

To identify earlier detection of diseases and health condition we propose a new concept HAND. It is used to identify the pulse of the authorized person, compares that pulse with the pulse stored in the generic database and alerts the authorized person using the interface through mobile. It takes the human pulse at regular intervals of time and stores in the specific database. This can be achieved by pervasive computing technology, Pervasive computing aims at creating environments saturated with embedded and portable computing devices surrounding the users and providing them with many interesting services. It has been gradually applied into our everyday life and its applications are becoming more and more extensive day by day [8].

Pulse is taken on an average three, four times per day on different intervals of time for proper assessment of nadi of that person. The pulse signals are taken and are converted in to electrical signals through sensors. Data Acquisition systems are used to convert waveforms into digital values for data classification. We use Naïve's Bayesian classification and Rule based classification algorithm for detecting the likelihood of occurrence of diseases.

A. *Considering an Example*,

Let X be a sample pulse rate data ("evidence") class label is unknown, Let H be a hypothesis that X belongs to class Ci (C1 as no disease ,C2 as disease earlier stage,C3 as disease intermediate stage, C4 as disease in final stages).

Hypothesis can be derived by using the parameters of input data, Range of pulse rate per minute, Normal (standard) pulse rate, Average pulse rate per day and No. of Deviations in pulse, etc and by applying Rule based Classification, we derive rules for detection of disease at diff stages

P(H) (prior probability): the initial probability, P(X): probability that sample data is observed

Classification is to determine P(H|X), the probability that the hypothesis holds given the observed data sample X, e.g., X has disease

P(X|H) (posteriori probability), the probability of observing the sample X given that the hypothesis holds,Given training data X, posteriori probability of a hypothesis H

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P(H|X), follows the Bayes theorem $P(H|X) = \frac{P(X|H)P(H)}{P(X)}$

Informally, this can be written as, posteriori = likelihood of getting the disease x prior/evidence.Predicts X belongs to C_i iff the probability $P(C_i|X)$ is the highest among all the $P(C_k|X)$ for all the k classes

By using Naïve Based Classification, Let D be a training set of tuples and their associated class labels, and each tuple is represented by an n-D attribute vector X = (x_1, x_2, …, x_n), suppose there are 4 classes C_1, C_2, C3 and C4. Classification is to derive the maximum posteriori, i.e., the maximal $P(C_i|X)$

From Bayes' theorem $P(C_i|X) = \frac{P(X|C_i)P(C_i)}{P(X)}$

Since P(X) is constant for all classes, only $P(C_i|X) = P(X|C_i)P(C_i)$ needs to be maximized.

In this way by using the Naïve Bayesian classification, the probability of the most likely occurrence of the disease and the disease stages can be known by taking the sample pulse rate data.

The major objective is to develop HAND-Health Analysis using Nadi Detection (Smart Card and the interface through Mobile) which can read the human pulse and provide the information, status of the health condition at that particular instance of time and can warn the person about the body and health conditions based on his nadi.

IV. CONCLUSION

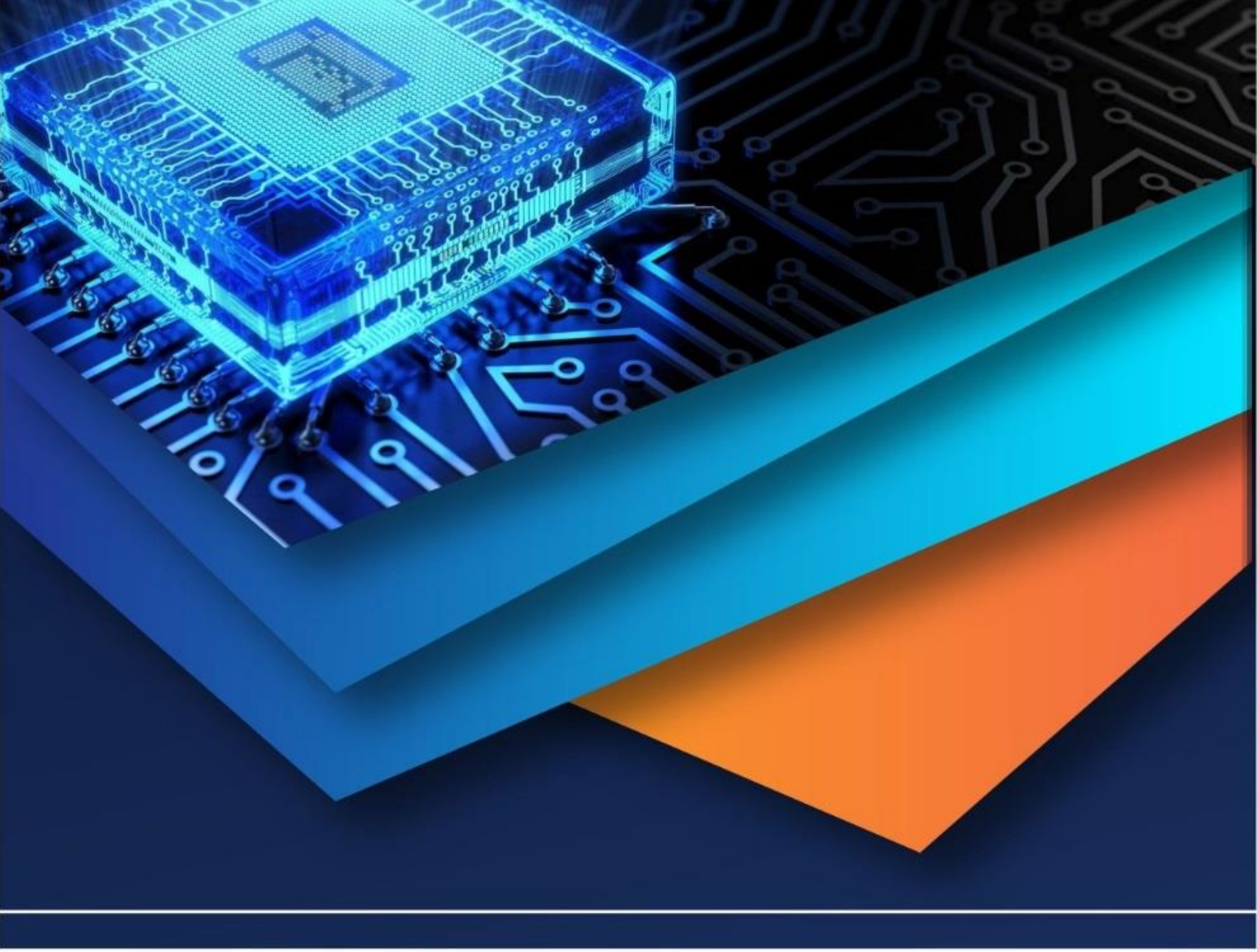
This paper explains about the importance of the Nadi Vaidyam and also how the technology can be used for pulse diagnosis. Even the modern hospitals are using the latest pulse diagnosis equipment for few diseases. This modern technology when applied in smart phones gives more efficient results.

HAND is used to help the common man to understand their health status without going to hospital and to avoid any disease becoming dreadful. This may also be used by doctors to check the patient's health condition very quickly and get the results accurately, effectively and efficiently.

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