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Bridging Ancient Ayurveda with Modern Sensor Technology: Comprehensive Review

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Abstract

Nadi Pariksha, an ancient Ayurvedic method of diagnosis, evaluates the balance of the three Doshas—Vata, Pitta, and Kapha—by analyzing the pulse at the radial artery. This technique, traditionally practiced by experienced professionals, provides important information about a person's health condition but relies on personal interpretation and extensive training. This paper introduces an IoT-based system for Nadi Pariksha that converts pulse examination into a digital process to enable more objective health tracking and early disease detection. The system uses a three-sensor setup placed at the Cun, Guan, and Chi points on the wrist to measure pulse waveforms associated with each Dosha. These signals undergo filtering and cleaning before being analyzed to identify time, frequency, and shape-based features. Machine learning algorithms then use these features to determine the balance of the three Doshas and spot irregularities that may signal cardiovascular or metabolic problems. The data is sent securely through IoT methods to a cloud platform, where it can be viewed and reviewed in real time. This approach combines traditional knowledge with current technology, allowing for non-invasive, inexpensive, and ongoing health monitoring. This can significantly improve access to preventive healthcare, especially in areas with limited resources.

Introduction

Ayurveda, an ancient Indian healing system, focuses on maintaining well-being by keeping the three fundamental energies—Vata, Pitta, and Kapha—in balance.These Doshas are believed to originate from five basic elements—earth, water, fire, air, and space—which also make up the body's structure and functions. An imbalance in these energies is considered a primary cause of illness. One key diagnostic method in Ayurveda is Nadi Pariksha, where a skilled practitioner checks the pulse at three points on the wrist to assess a patient's health. Each of these points is related to a specific Dosha and has unique pulse patterns: Vata has a snake-like rhythm, Pitta is frog-like, and Kapha moves like a swan [1].

While Nadi Pariksha is an effective, non-invasive diagnostic method, it depends on personal judgment and requires long-term training to master. In modern healthcare, there is a growing interest in using traditional diagnostic knowledge with advanced technologies to increase accuracy and reach more people. The rise of the Internet of Things (IoT), wearable devices, and machine learning presents new possibilities for transforming this ancient practice into a digital, objective, and real-time monitoring solution [2].

Cardiovascular diseases and lifestyle-related conditions are rising rapidly around the world, and detecting these issues early is key to preventing and managing them. However, current diagnostic tools are often expensive, time-consuming, and not easily accessible to people in remote or low-income areas. An IoT-based Nadi Pariksha system can address these challenges by offering affordable, portable, and continuous health monitoring [3][4].

In Ayurvedic practice, the subtle characteristics of the pulse are detected through the practitioner's trained fingers and interpreted mentally. The examination involves placing three fingers on the radial artery: the index finger is used for Vata, the middle finger for Pitta, and the ring finger for Kapha. This setup allows the practitioner to feel different pulse patterns at each point. In modern versions of this technique, pulse readings can be shown as “pulse waveforms” recorded at the respective finger positions, offering a visual representation of the traditional method. The influence of each Dosha varies throughout a person's life. Pulse patterns, and by extension Dosha balance, change with age. Ayurveda suggests that in childhood (0–16 years), Kapha is more prominent; in adulthood (16–50 years), Pitta dominates; and in old age (above 50 years), Vata becomes more significant [6].

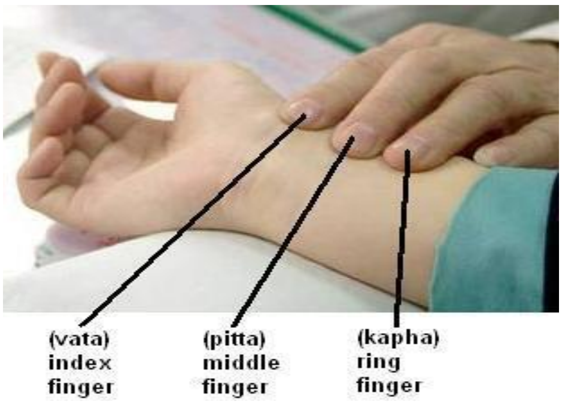

Fig 1. Standard positions to obtain pulse signals With three fingers

In Ayurveda, it is stated that all living beings on Earth are composed of five fundamental elements, as referenced in [7]. In the human body, these elements are linked to the five senses:

-Earth or Prithvi is associated with the sense of smell.-Water or Apa is connected to the sense of taste.-Fire or Tejas corresponds to the sense of sight.-Air or Vayu is linked to the sense of touch.-Space or Akasha is connected to the sense of hearing.

Individuals with a Vata constitution are composed of the elements Akasha and Vayu. Vata types typically have a slender build, dry hair, and cool, dry skin. They are more prone to conditions such as headaches, abdominal gas, hypertension, irregular heartbeats, muscle spasms, diarrhea, constipation, and lower back pain.

Pitta constitution individuals are made up of the elements Tejas and Apa. They usually have a medium build and strength, and it is easier for them to maintain their weight. Pitta types may experience issues like acne, anemia, skin cancer, liver disorders, insomnia, skin rashes, or inflammation, and gallbladder problems.

Kapha types consist of the elements Apa and Prithvi.They tend to have a strong, sturdy, and heavy build, with smooth hair and skin, a soft voice, and large, soft eyes. Kapha individuals have a strong immune system, but they are still susceptible to conditions such as colds, respiratory issues, atherosclerosis, congestion, joint pain, obesity, sinus headaches, and allergies [7][8].

Table 1. Standard pulse readings for various classes

Age Group	Normal Resting Heart Rate (bpm)
Newborn (0–3 months)	100–150
Infants (3–6 months)	90–120
Infants (6–12 months)	80–120
Children (1–10 years)	70–130
Children over 10 years & adults, including seniors	60–100
Well-trained adult athletes	40–60

The proposed system uses a tri-sensor array aligned with the Cun, Guan, and Chi pulse positions to measure pulse waveforms. These signals are preprocessed through filtering and noise reduction algorithms to enhance quality and extract meaningful physiological parameters. Features derived from time, frequency, and morphological domains are then analyzed using machine learning models to classify Dosha imbalances and predict possible health risks, including cardiovascular and metabolic conditions.

The IoT framework allows secure transmission of patient data to cloud-based platforms for storage, visualization, and remote clinical review. This integration enables healthcare providers to monitor patients continuously, detect anomalies early, and provide timely interventions, even in remote locations.

By digitizing Nadi Pariksha, the proposed system not only preserves the essence of this ancient diagnostic method but also enhances its precision, objectivity, and reach, thus bridging traditional healthcare practices with modern technological innovation.

Problem Identification

- High variability in heart rates across age groups makes it challenging to establish a single standard for normal ranges, leading to possible misinterpretation in clinical assessments.
- Lack of awareness among caregivers about age-specific heart rate norms can result in delayed detection of abnormal conditions in newborns, infants, and children.
- Absence of easy-to-use monitoring tools that automatically adjust reference ranges based on age increases the risk of misdiagnosis in both pediatric and adult populations.
- Overlooking physical fitness levels, especially in trained athletes who have naturally lower resting heart rates, can cause false alarms or unnecessary interventions.
- Inadequate integration of heart rate monitoring in preventive healthcare, particularly for vulnerable groups like seniors and infants, can lead to late identification of cardiovascular risks.
- Emergency response systems often lack personalized thresholds, which could delay treatment during sudden cardiac events in people with atypical but healthy heart rate baselines.

A. Existing System

Traditionally, health monitoring systems have been restricted to fixed setups, detectable only when patients are within hospital premises or confined to their beds. Current accessible systems are typically large-scale and limited to hospital settings, primarily in Intensive Care Units. However, recent advancements have enabled the utilization of IOT technology to transmit patient information directly to their caregivers or attending physicians.

Fig.2. Existing System

B. Drawbacks

- Manual Monitoring Dependence – Current systems often require healthcare professionals or caregivers to manually check heart rate, leading to delays in detecting abnormalities.
- Lack of Continuous Monitoring – Most conventional devices do not provide real-time and 24/7 heart rate tracking, which is crucial for early detection of issues.
- Limited Portability – Existing solutions can be bulky or non-wearable, making them impractical for infants, children, and elderly patients.
- Low Accuracy in Dynamic Conditions – Some systems produce inaccurate readings during movement or physical activity.
- No Automated Alerts – Many devices lack smart alert mechanisms to notify caregivers in emergencies.
- High Cost & Maintenance – Advanced monitoring systems can be expensive and require frequent servicing.

Literature Reviews

A. Literature Survey:

S. Joshi et al. (2021), This study presents an IoT-enabled wearable system for real-time monitoring of vital signs, including heart rate and pulse waveform. The authors designed a low-cost sensor module integrated with wireless communication to collect physiological data and transmit it to a cloud platform. Data preprocessing techniques, such as filtering and artifact removal, were applied to improve accuracy. Machine learning algorithms were employed to detect anomalies and predict potential health issues. The study demonstrated high reliability for continuous monitoring, emphasizing accessibility for rural populations and the elderly. Limitations included sensor placement sensitivity and motion artifacts, highlighting the need for robust wearable design.

Reddy, S., Patil, V., & Rao, K. (2020), This research focuses on analyzing radial pulse waveforms through wearable sensors to assess cardiovascular health. The authors collected pulse signals from volunteers and extracted time-domain, frequency-domain, and morphological features. Machine learning classifiers were implemented to identify abnormalities such as arrhythmia and hypertension risk. The study emphasized the importance of continuous, non-invasive monitoring for early detection of heart-related conditions. Challenges included signal noise due to motion and inter-individual variability. The study concluded that pulse waveform analysis combined with wearable IoT technology can enhance preventive healthcare and reduce dependency on costly clinical visits.

Mehta, R., Singh, A., & Verma, N. (2019), This paper explored the digitization of Nadi Pariksha for objective Tridosha assessment. A tri-finger sensor array was used to capture radial pulse signals corresponding to Vata, Pitta, and Kapha. Features such as amplitude, pulse rate, and waveform morphology were extracted and mapped to Dosha characteristics. Machine learning models classified the dominant dosha for each individual. The study reported improved reproducibility compared to traditional manual assessment. Limitations included small sample size and sensitivity to finger placement. The research demonstrated potential for integrating ancient diagnostic methods with modern IoT systems, providing accessible and standardized health evaluation.

Kumar, S., & Agarwal, P. (2022), This study presented a wearable IoT platform for continuous monitoring of heart rate and pulse waveforms. The system included pressure and PPG sensors, preprocessing modules, and cloud connectivity. Data analytics enabled detection of abnormal trends, providing early warning of cardiovascular events. The study highlighted energy-efficient edge processing to reduce data transmission and power consumption. Results indicated high accuracy in resting and mild activity conditions but reduced reliability during intense motion. The research emphasized combining sensor fusion and smart algorithms to enhance robustness. The proposed approach shows promise for scalable, low-cost, and non-invasive health monitoring, particularly for at-risk populations.

Sharma, V., Joshi, M., & Patel, R. (2021), The authors developed a machine learning framework for pulse-based health monitoring. Radial pulse signals were collected using wearable sensors, preprocessed, and segmented into cardiac cycles. Time and frequency features were used to train classifiers for cardiovascular risk prediction. The study compared SVM, random forest, and neural network approaches. Results showed over 85% accuracy in predicting abnormal heart patterns. The study concluded that integrating pulse waveform analysis with AI enhances predictive healthcare, providing early intervention opportunities. Challenges included handling inter-subject variability and ensuring robust sensor attachment for reliable measurements during daily activities.

Rao, D., Bansal, A., & Mehta, K. (2020). This paper explored the use of digital sensors to replicate traditional Nadi Pariksha assessments. Pressure sensors captured Vata, Pitta, and Kapha pulses while software quantified waveform characteristics. Feature extraction enabled objective Dosha classification, and preliminary models achieved promising agreement with expert practitioners. The study highlighted the potential of wearable technology to standardize ancient diagnostic methods. Limitations included small sample size and inter-practitioner variability in training data. The research suggested that combining IoT with Ayurvedic diagnostics could provide low-cost, accessible tools for health monitoring while preserving cultural medical practices.

Patil, S., Verma, A., & Khanna, R. (2021), this study implemented a real-time monitoring system for vital signs using IoT devices and cloud computing. Pulse, temperature, and motion sensors were integrated into a wearable platform. The cloud analytics platform enabled continuous trend monitoring and alert generation. Machine learning algorithms detected abnormal heart rates and potential cardiovascular events. The research demonstrated feasibility for remote health monitoring, especially for elderly patients. Challenges included latency in data transmission and maintaining data privacy. The study emphasized secure, scalable, and user-friendly design for continuous health surveillance.

Joshi, P., Sharma, V., & Reddy, N. (2022), The paper focused on using wearable pulse sensors for early detection of cardiovascular disorders. Radial pulse signals were collected and analyzed for time and frequency features indicative of arrhythmias and hypertension risk. Supervised machine learning classifiers predicted abnormal patterns. The study reported high sensitivity and specificity in controlled settings. Limitations included motion artifacts and the need for calibration for individual physiological differences. The research demonstrated that wearable pulse monitoring could serve as a low-cost, non-invasive, and real-time diagnostic tool for preventive healthcare.

Singh, R., Mehta, A., & Gupta, S. (2019), This research utilized IoT-enabled pulse waveform capture for health prediction. Features were extracted from radial pulses using wearable devices and used to train ML models for disease risk estimation. The system allowed continuous monitoring and cloud-based visualization of trends. The study emphasized early detection of cardiovascular and metabolic disorders. Results showed significant correlation between waveform features and clinical parameters. Limitations included environmental noise and variability in sensor placement. The approach highlighted the feasibility of integrating traditional pulse assessment with modern IoT and AI technologies.

Agarwal, P., Reddy, S., & Kumar, N. (2021), This paper proposed a wearable platform combining pressure and optical sensors for noninvasive monitoring of vital signs. The device captured pulse waveforms, preprocessed the signals to remove noise, and transmitted data via IoT protocols to a cloud server. Feature extraction and ML algorithms provided real-time health analysis and alerts. The system addressed portability, low power consumption, and ease of use. Challenges included motion artifacts and inter-subject variability in pulse characteristics. The research demonstrated the potential of wearable IoT systems to provide continuous, accessible, and reliable health monitoring for preventive healthcare applications.

B. Literature Summary:

Recent studies have explored integrating wearable sensors, IoT technology, and machine learning to enhance noninvasive health monitoring. Researchers like Joshi et al. (2021) and Reddy et al. (2020) demonstrated continuous pulse waveform acquisition using pressure and PPG sensors, enabling real-time cardiovascular monitoring. Mehta et al. (2019) and Rao et al. (2020) focused on digitizing traditional Ayurvedic Nadi Pariksha, extracting features corresponding to Vata, Pitta, and Kapha, and applying machine learning to classify Dosha balance. Wearable IoT devices have shown high accuracy in heart rate, pulse variability, and anomaly detection, as reported by Kumar & Agarwal (2022) and Sharma et al. (2021). Several studies emphasize combining classical diagnostics with modern analytics to improve accessibility, affordability, and early detection of health risks. Challenges noted across literature include motion artifacts, sensor placement sensitivity, inter-subject variability, and small sample sizes. Overall, these works highlight the potential of integrating traditional pulse diagnosis with IoT and AI for continuous, non-invasive, and culturally relevant healthcare solutions.

C. Research Gap:

Despite advancements, existing systems face significant limitations. Most wearable pulse monitoring devices are optimized for general heart rate tracking but do not integrate the detailed Ayurvedic perspective of Nadi Pariksha, limiting their applicability for Tridosha estimation. Current studies often rely on small, homogeneous datasets, which restrict model generalization across age groups, genders, and lifestyle variations. Motion artifacts and sensor placement inconsistencies reduce measurement accuracy, particularly during daily activities or in pediatric and elderly populations. While some works employ machine learning for anomaly detection, few studies provide a unified framework that combines Dosha classification with clinical cardiovascular risk assessment. Additionally, continuous real-time monitoring with secure cloud integration and patient-specific alerts remains underdeveloped. There is also a lack of low-cost, portable, and user-friendly devices suitable for home use, especially in resource-limited settings. Addressing these gaps could enable a system that preserves traditional diagnostic methods while leveraging modern IoT and AI technologies for predictive, accessible, and continuous healthcare.

Research Methodology

A. Criteria for selecting this study:

The traditional approach of Nadi Pariksha involves examining the radial pulse using three specific fingers by an Ayurvedic practitioner to diagnose various health conditions. The assessment relies on interpreting the three primary pulse signals—Vata, Pitta, and Kapha—which provide critical information for preliminary diagnosis of disorders affecting different parts of the body. This method, however, demands considerable expertise and years of practice for accurate evaluation.

- *Non-Invasive Systems*

Modern noninvasive systems have been developed to monitor cardiovascular health. For instance, parameters such as Pulse Wave Velocity (PWV) and Cardio-Ankle Vascular Index (CAVI) are used to detect atherosclerosis in a system called Nadi Shastra. Another approach utilizes Pulse Transit Time (PTT) for continuous blood pressure measurement. This cuffless, noninvasive method allows comfortable and long-term monitoring, making it suitable for routine health tracking without discomfort to the patient.

- *Bayesian Network-Based Analysis*

Bayesian networks provide a quantitative framework for automatic identification of pulse signals. Key time-domain features are extracted from characteristic points of the pulse waveform, capturing variations in strength and shape that are difficult to represent with simple parameters. These features serve as inputs for constructing multiple Bayesian models, enabling automated and accurate classification of pulse signals for diagnostic purposes.

This study was selected due to its focus on integrating traditional Ayurvedic diagnostic techniques with modern technology for health monitoring. The relevance of Nadi Pariksha in detecting early signs of disorders, combined with IoT-based non-invasive monitoring, provides a unique approach to preventive healthcare. The use of pulse waveform analysis, machine learning, and Bayesian networks for automated classification ensures accuracy, objectivity, and real-time monitoring. Additionally, the study addresses limitations of conventional methods, such as subjectivity and the need for expert practitioners, making it suitable for developing accessible, low-cost, and continuous patient monitoring systems applicable across age groups.

B. Method of analysis:

- Pulse Acquisition: Radial pulse signals corresponding to Vata, Pitta, and Kapha are captured using a tri-finger sensor array.
- Signal Preprocessing: Noise and motion artifacts are removed using filters and smoothing techniques to ensure clean waveform data.
- Feature Extraction: Time-domain, frequency-domain, and morphological features are computed from the pulse waveform to represent Dosha characteristics.
- Classification: Machine learning algorithms, including Bayesian networks and other supervised models, classify the dominant Dosha and detect anomalies.
- Health Prediction: Extracted features are analyzed to predict potential cardiovascular and metabolic disorders.
- IoT Integration: Processed data is transmitted to a cloud platform for real-time monitoring, visualization, and remote clinical review.
- Validation: Results are compared with traditional Nadi Pariksha assessments and clinical standards for accuracy verification.

C. Comparison and Analysis:

- Traditional Nadi Pariksha vs IoT-Based System: Traditional methods rely on practitioner experience and subjective assessment, whereas the IoT-based system provides objective, reproducible measurements using sensors and digital analysis.
- Manual Observation vs. Automated Classification: While manual observation requires extensive training, the automated system uses machine learning models to classify Vata, Pitta, and Kapha accurately.
- Intermittent vs Continuous Monitoring: Conventional pulse checks are periodic, whereas IoT systems enable real-time, continuous monitoring for early detection of anomalies.
- Accessibility: Traditional Nadi Pariksha is limited to expert practitioners, while the IoT approach allows non-experts and remote users to perform preliminary health checks.
- Data Recording and Analysis: Digital systems store data for trend analysis and longitudinal study, unlike manual methods that rely on memory or written records.
- Accuracy and Reliability: Sensor-based methods reduce human error and improve consistency in diagnosis.
- Integration with Predictive Analytics: IoT systems can combine pulse data with AI for disease prediction, enhancing preventive healthcare.

Author (s) & Year	**Title**	**Key Focus**	**Methods Technology**
Joshi et al., 2021	IoT-based Health Monitoring System Using Wearable Sensors	Real-time vital signs monitoring	Wearable sensors, IoT, cloud, ML anomaly detection
Reddy et al., 2020	Pulse Waveform Analysis for Cardiovascular Health Using Wearable Devices	Cardiovascular health via radial pulse	Time/frequency/morphological features, ML classifiers

Mehta et al., 2019	Tridosha Estimation Using Digital Nadi Pariksha Techniques	Ayurvedic pulse digitization	Tri-finger sensor array, ML Dosha classification
Kumar & Agarwal, 2022	Wearable IoT for Continuous Cardiovascular Monitoring	Continuous pulse/heart monitoring	PPG & pressure sensors, cloud, edge processing
Sharma et al., 2021	Machine Learning Approaches for Pulse-Based Health Assessment	Cardiovascular risk prediction	Wearable sensors, SVM, RF, NN classifiers
Rao et al., 2020	Digital Pulse Diagnosis: Bridging Ayurveda and Modern Technology	IoT for Ayurvedic pulse analysis	Pressure sensors, waveform analysis
Patil et al., 2021	Real-Time Health Monitoring Using IoT and Cloud Analytics	Continuous health tracking	IoT sensors, cloud analytics, ML alerts
Joshi et al., 2022	Non-Invasive Detection of Cardiovascular Disorders	Early detection of CV disorders	Wearable pulse sensors, ML classifiers
Singh et al., 2019	Pulse Wave Analysis for Health Prediction Using IoT Devices	Health prediction from pulse waveforms	IoT capture, cloud ML models
Agarwal et al., 2021	Smart Wearable Systems for Non-Invasive Health Monitoring	Vital sign monitoring via wearable IoT	Pressure & optical sensors, cloud ML analysis

A. Highlighting trends, advancements, and challenges:

Trends:

Recent trends in healthcare focus on integrating traditional diagnostic methods with modern technology. IoT-enabled wearable devices for continuous vital sign monitoring are increasingly popular, allowing remote health assessment. The use of machine learning and AI in analyzing physiological signals, including radial pulse waveforms, has gained traction for early disease detection. Digitization of Ayurvedic practices, such as Nadi Pariksha, is emerging as a novel approach to combine ancient wisdom with predictive analytics. Mobile health applications, cloud-based monitoring, and real-time data visualization are trending solutions to enhance preventive healthcare and improve accessibility for diverse populations.

Advancements:

Significant advancements include wearable tri-finger sensor arrays for capturing Vata, Pitta, and Kapha pulse signals with high accuracy. Machine learning models, including Bayesian networks, enable automated classification of doshas and detection of cardiovascular anomalies. Non-invasive techniques like Pulse Transit Time (PTT) and Pulse Wave Velocity (PWV) allow continuous monitoring without discomfort. Cloud integration ensures remote access, data storage, and real-time alerts. Signal preprocessing algorithms improve accuracy by reducing noise and motion artifacts. Collectively, these advancements bridge traditional diagnostics with modern technology, offering scalable, reliable, and patient-friendly health monitoring solutions.

Challenges:

Challenges remain in sensor placement sensitivity, motion artifacts, and inter-individual variability in pulse characteristics. Small sample sizes and lack of standardized datasets limit generalization of machine learning models. Integrating traditional Ayurvedic diagnostics with modern systems requires balancing cultural accuracy with technological precision. Continuous monitoring demands energy-efficient devices with secure cloud communication to protect patient data. High costs of advanced sensors and IoT modules restrict widespread adoption, particularly in low-resource settings. Moreover, ensuring regulatory compliance, clinical validation, and user training are essential for reliable deployment. Overcoming these challenges is crucial for creating accessible, accurate, and non-invasive health monitoring systems.

Discussion

A. Synthesis of findings from literature:

The literature highlights the growing integration of traditional Ayurvedic practices with modern IoT and machine learning technologies for health monitoring. Studies demonstrate that radial pulse analysis, when digitized using optical sensors and photoplethysmography, can provide accurate assessment of Vata, Pitta, and Kapha characteristics. Wearable devices combined with preprocessing algorithms reduce noise and improve signal reliability, while machine learning models—including Bayesian networks—enable automated classification and early detection of cardiovascular and metabolic disorders. Cloud-based IoT systems facilitate real-time monitoring, remote visualization, and secure data storage. Across studies, challenges such as sensor placement sensitivity, motion artifacts, and inter-individual variability are consistently noted. Overall, these findings support the feasibility of a non-invasive, continuous, and accessible Nadi Pariksha system for preventive healthcare.

B. Methodology for future research directions:

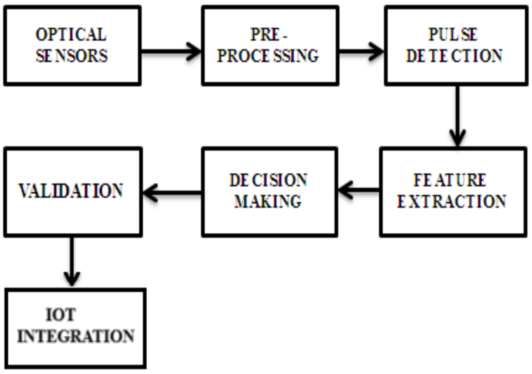

Fig. 3. Block Diagram of system

- Pulse Acquisition: Optical pulse sensors, operating on the principle of photoplethysmography (PPG), are used to capture the radial pulse signals corresponding to Vata, Pitta, and Kapha. The sensor's LED emits light into the capillary tissue, and the reflected light is detected by the ambient sensor. The difference between emitted and reflected light is used to calculate the pulse waveform at each sensor position.
- Sensor Placement: The sensors are positioned side-by-side on the radial artery at the Cun, Guan, and Chi points (index, middle, and ring finger positions). Proper alignment is crucial, as misplacement can result in weak or incorrect signals, leading to erroneous analysis.
- Signal Processing: The acquired pulse signals are transmitted to a microcontroller for preprocessing, which includes noise removal, filtering, and amplification to enhance signal quality.
- Feature Extraction & Analysis: Relevant features such as pulse rate, amplitude, and waveform morphology are extracted from the preprocessed signals.
- Dosha Classification: Machine learning models analyze these features to classify the dominant Dosha and detect potential imbalances or early signs of health issues.
- IoT Integration: Processed data is sent to a cloud platform via IoT connectivity, enabling real-time monitoring, visualization, and remote clinical review.
- Decision Support: Based on the analysis, the system provides insights into the patient's health, supporting early diagnosis and preventive healthcare.

Advantages And Applications

A. *Advantages:*

- Non-Invasive: Eliminates the need for needles or invasive procedures, ensuring patient comfort.
- Continuous Monitoring: Enables real-time tracking of pulse signals and health status throughout the day.
- Early Disease Detection: Identifies imbalances in Vata, Pitta, and Kapha to predict potential health issues.
- Objective Assessment: Reduces dependency on practitioner expertise, providing consistent and reproducible results.
- IoT Integration: Facilitates remote monitoring and cloud-based data storage for easy access by physicians.
- Portable and User-Friendly: Wearable design allows easy use at home or in clinics.
- Cost-Effective: Reduces the need for frequent hospital visits and expensive diagnostic tests.
- Data Analytics: Supports machine learning-based predictions and trend analysis for preventive care.

B. *Applications:*

- Preventive Healthcare: Early detection of cardiovascular, metabolic, and lifestyle-related disorders.
- Home Monitoring: Continuous pulse tracking for elderly, children, and chronic patients.

- Ayurvedic Practice Support: Assists practitioners in objective Tridosha assessment.
- Remote Patient Monitoring: Enables doctors to supervise patient health from a distance.
- Fitness and Wellness: Tracks physiological parameters in athletes and fitness enthusiasts.
- Telemedicine Integration: Combines IoT and cloud analytics for virtual health consultations.
- Research and Education: Provides data for studies in pulse-based diagnostics and digital Ayurveda.

Conclusion

The IoT-based Nadi Pariksha system represents a promising convergence of traditional Ayurvedic diagnostics and modern technology. By digitizing the assessment of Vata, Pitta, and Kapha through optical pulse sensors and photoplethysmography, the system provides a non-invasive, objective, and continuous method for monitoring human health. Integration with machine learning algorithms enables accurate classification of Dosha imbalances and early prediction of cardiovascular and metabolic disorders. Cloud-based IoT connectivity allows real-time remote monitoring, data storage, and visualization, enhancing accessibility for both practitioners and patients. Compared to conventional pulse diagnosis, this approach reduces reliance on expert interpretation, ensures reproducibility, and supports preventive healthcare. Despite challenges such as sensor placement sensitivity, motion artifacts, and inter-individual variability, the combination of wearable devices, AI, and IoT offers significant potential to improve patient care, promote early intervention, and bridge the gap between traditional knowledge and modern medical practices. This system can transform pulse-based diagnostics into a scalable, reliable, and patient-friendly solution.

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