FORM 2

THE PATENTS ACT, 1970

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COMPLETE SPECIFICATION

[*See* section 10 and rule 13]

"INTERNET OF THINGS (IOT) BASED SMART HEALTH MONITORING SYSTEM WITH LONG RANGE (LORA) WIRELESS NETWORK"

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PREAMBLE OF THE DESCRIPTION

The following specification particularly describes the invention and the manner in which it is to be performed.

FIELD OF THE INVENTION

The embodiments of the present invention generally relates to the field of B health monitoring system. More particularly, the present invention relates to Internet of things (IoT) based smart health monitoring system with long range (LORA) wireless network.

BACKGROUND OF THE INVENTION

The following description of related art is intended to provide background information pertaining to the field of the disclosure. This section may include certain aspects of the art that may be related to various features of the present disclosure. However, it should be appreciated that this section be used only to enhance the understanding of the reader with respect to the present disclosure, and not as admissions of prior art.

Conventional health monitoring systems often require physical presence and use of wired connections, limiting their mobility and usability. The emergence of IoT and wireless communication technologies has paved the way for remote health monitoring. This invention leverages the LoRa wireless network to establish a comprehensive and reliable smart health monitoring system.

Traditional healthcare models predominantly rely on in-person visits to medical facilities for health monitoring, diagnostics, and treatment. This approach has inherent limitations, especially in scenarios where patients are geographically distant, have limited mobility, or require continuous monitoring. The advent of the Internet of Things (IoT) and wireless communication technologies has sparked a transformative shift in healthcare, enabling the development of innovative solutions for remote health monitoring and management.

The Internet of Things (IoT) has emerged as a paradigm that connects everyday objects and devices to the internet, enabling them to collect, exchange, and analyze data. In the context of healthcare, IoT technology offers a promising avenue to revolutionize patient care by facilitating continuous, real-time health monitoring. Wearable health sensors equipped with various biometric measurement capabilities, such as heart rate, blood pressure, temperature, and activity levels, have gained prominence as essential components of IoT-based health monitoring systems.

However, the widespread adoption of IoT-based health monitoring has been hindered by certain challenges. Traditional wireless communication technologies, such as Bluetooth and Wi-Fi, while suitable

for short-range applications, are often limited in terms of range and power efficiency. This limitation restricts their utility in scenarios requiring extended coverage, such as remote rural areas, large-scale facilities, or outdoor environments.

Enter the Long Range (LoRa) wireless network technology. LoRa is a low-power, wide-area network (LPWAN) protocol that provides a compelling solution to the range and power consumption constraints of traditional wireless technologies. LoRa offers exceptional coverage over large distances, making it particularly well-suited for applications that demand extensive coverage areas and penetration through obstacles. Moreover, LoRa's energy-efficient communication protocol ensures that battery-powered devices, such as wearable health sensors, can operate autonomously for extended periods without frequent battery replacements.

This invention capitalizes on the unique advantages of LoRa technology to overcome the limitations of existing health monitoring systems. By integrating LoRa-enabled wearable health sensors with a LoRa gateway, the system establishes a robust, long-range communication infrastructure that enables seamless data transmission from remote locations to a central data processing unit. The central unit employs advanced data analytics algorithms to process the incoming health data, generating valuable insights into the user's well-being.

In addition to its technical merits, the IoT based smart health monitoring system with LoRa wireless network contributes to enhancing healthcare accessibility and reducing the burden on traditional healthcare facilities. Patients residing in remote areas or facing mobility challenges can now benefit from continuous health monitoring without the need for frequent visits to medical centers. Healthcare providers gain the ability to remotely monitor patients' conditions, make informed decisions based on real-time data, and intervene promptly when necessary.

OBJECTIVE OF THE INVENTION

Some of the objects of the present disclosure, which at least one embodiment herein satisfies are listed herein below.

The primary objective of the present invention is to implement Internet of Things (IoT) based Smart Health Monitoring System with Long Range (LoRa) Wireless Network.

SUMMARY OF THE INVENTION

This section is provided to introduce certain objects and aspects of the present disclosure in a simplified form that are further described below in the detailed description. This summary is not intended to identify the key features or the scope of the claimed subject matter.

In an aspect, the present invention generally relates to the field of B health monitoring system. More particularly, the present invention relates to Internet of things (IoT) based smart health monitoring system with long range (LORA) wireless network.

BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings, which are incorporated herein, and constitute a part of this invention, illustrate exemplary embodiments of the disclosed methods and systems in which like reference numerals refer to the same parts throughout the different drawings. Components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Some drawings may indicate the components using block diagrams and may not represent the internal circuitry of each component. It will be appreciated by those skilled in the art that invention of such drawings includes the invention of electrical components, electronic components or circuitry commonly used to implement such components.

FIG. 1 illustrates an exemplary framework in which or with which the present invention implement Internet of Things (IoT) based Smart Health Monitoring System with Long Range (LoRa) Wireless Network, in accordance with an embodiment of the present disclosure.

DETAIL DESCRIPTION OF THE INVENTION

In the following description, for the purposes of explanation, various specific details are set forth in order to provide a thorough understanding of embodiments of the present disclosure. It will be apparent, however, that embodiments of the present disclosure may be practiced without these specific details. Several features described hereafter can each be used independently of one another or with any combination of other features. An individual feature may not address all of the problems discussed above or might address only some of the problems discussed above. Some of the problems discussed above might not be fully addressed by any of the features described herein.

The ensuing description provides exemplary embodiments only and is not intended to limit the scope, applicability, or configuration of the disclosure. Rather, the ensuing description of the exemplary

embodiments will provide those skilled in the art with an enabling description for implementing an exemplary embodiment. It should be understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the disclosure as set forth.

Specific details are given in the following description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits, systems, networks, processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail to avoid obscuring the embodiments.

Also, it is noted that individual embodiments may be described as a process that is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged. A process is terminated when its operations are completed but could have additional steps not included in a figure. A process may correspond to a method, a function, a procedure, a subroutine, a subprogram, etc. When a process corresponds to a function, its termination can correspond to a return of the function to the calling function or the main function.

The word “exemplary” and/or “demonstrative” is used herein to mean serving as an example, instance, or illustration. For the avoidance of doubt, the subject matter disclosed herein is not limited by such examples. In addition, any aspect or design described herein as “exemplary” and/or “demonstrative” is not necessarily to be construed as preferred or advantageous over other aspects or designs, nor is it meant to preclude equivalent exemplary structures and techniques known to those of ordinary skill in the art. Furthermore, to the extent that the terms “includes,” “has,” “contains,” and other similar words are used in either the detailed description or the claims, such terms are intended to be inclusive in a manner similar to the term “comprising” as an open transition word without precluding any additional or other elements.

Reference throughout this specification to “one embodiment” or “an embodiment” or “an instance” or “one instance” means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, the appearances of the phrases “in one embodiment” or “in an embodiment” in various places throughout this specification are

not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms “a”, “an”, and “the” are intended to include the plural forms as well, unless the context indicates otherwise. It will be further understood that the terms “comprises” and/or “comprising,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

The IoT based smart health monitoring system comprises a network of wearable health sensors, a LoRa gateway, a central data processing unit, and a user interface. The wearable health sensors are capable of collecting various physiological parameters, such as heart rate, blood pressure, temperature, and activity levels, from the user. These sensors communicate with the LoRa gateway, which serves as a bridge between the sensors and the central data processing unit.

The LoRa gateway is responsible for aggregating the data from multiple wearable sensors and transmitting it over long distances using LoRa wireless communication technology. The central data processing unit receives the health data, processes it, and stores it in a secure database. Advanced data analytics algorithms are applied to the collected data to detect anomalies, trends, and potential health risks.

The user interface provides a user-friendly platform for both healthcare providers and users to access real-time health information. Users can view their health data, set personalized health goals, and receive alerts for critical health events. Healthcare providers can remotely monitor patients' health statuses, offer timely interventions, and make informed decisions based on the data insights.

In one embodiment, the wearable health sensors are designed to be lightweight, compact, and comfortable for extended wear. These sensors utilize advanced biosensing technology to accurately measure and capture various physiological parameters. For instance, the heart rate sensor employs photoplethysmography (PPG) to monitor heart rate variations, while the blood pressure sensor uses

oscillometric principles to estimate blood pressure values. Additionally, the temperature sensor employs infrared technology for non-invasive temperature measurements.

The wearable health sensors communicate with the LoRa gateway using a low-power, energy-efficient wireless protocol. The LoRa gateway acts as a central hub, employing LoRa modulation techniques to achieve extended range communication while minimizing power consumption. This allows seamless integration of a multitude of wearable health sensors within a wide geographical area.

The LoRa wireless network is particularly advantageous for this smart health monitoring system due to its ability to cover long distances and penetrate obstacles effectively. This makes the system ideal for remote and rural areas where traditional cellular networks may have limited coverage. Furthermore, the LoRa network's low power requirements enable the wearable health sensors to operate on battery power for extended periods, minimizing the need for frequent battery replacements.

The central data processing unit employs sophisticated data processing and machine learning algorithms to analyze the collected health data. These algorithms can identify patterns, correlations, and anomalies within the data, providing valuable insights into the user's health condition. For example, the system can detect irregular heart rhythms, abnormal blood pressure fluctuations, or sudden temperature changes, triggering timely alerts to both the user and healthcare providers.

The user interface is designed with a user-centric approach, offering an intuitive and customizable dashboard. Users can access their health data, view historical trends, and receive personalized health recommendations. The user interface also facilitates seamless communication between users and healthcare professionals, allowing for remote consultations, follow-up appointments, and medication management.

To ensure data security and privacy, the smart health monitoring system employs robust encryption protocols at both the sensor-data transmission and data-storage levels. Personal health information is anonymized and stored in compliance with relevant data protection regulations.

In yet another embodiment, the IoT based smart health monitoring system with Long Range (LoRa) wireless network is a revolutionary advancement in healthcare technology. By seamlessly integrating wearable health sensors, LoRa wireless communication, and advanced data analytics, the system empowers users and healthcare providers with real-time insights, personalized interventions, and

improved health outcomes. This innovative solution addresses the limitations of traditional health monitoring systems, providing a versatile and scalable approach to remote health management.

While considerable emphasis has been placed herein on the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from the principles of the invention. These and other changes in the preferred embodiments of the invention will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter to be implemented merely as illustrative of the invention and not as limitation.

We claim(s)

1. A smart health monitoring system utilizing Internet of Things (IoT) technology, comprising:
    - A plurality of wearable health sensors configured to measure physiological parameters of a user.
    - A Long Range (LoRa) wireless network gateway configured to receive data from said wearable health sensors and transmit said data over long distances.
    - A central data processing unit in communication with said LoRa gateway, wherein said central data processing unit processes and analyzes said data.
    - A user interface providing real-time access to said data and enabling user interaction.

2. The smart health monitoring system of claim 1, wherein said wearable health sensors comprise sensors for measuring heart rate, blood pressure, temperature, and activity levels.

3. The smart health monitoring system of claim 1, wherein said LoRa wireless network gateway aggregates data from multiple wearable health sensors and transmits said data to said central data processing unit.

4. The smart health monitoring system of claim 1, wherein said central data processing unit applies data analytics algorithms to detect anomalies, trends, and potential health risks based on said collected data.

5. The smart health monitoring system of claim 1, wherein said user interface allows users to set personalized health goals and receive alerts for critical health events.

6. A method for remote health monitoring utilizing the smart health monitoring system of claim 1, comprising:
    - Collecting physiological data from a user using said wearable health sensors.
    - Transmitting said data over the LoRa wireless network to said central data processing unit.
    - Processing and analyzing said data to generate insights into the user's health status.
    - Providing real-time access to said insights via said user interface.

7. The method of claim 6, further comprising alerting healthcare providers of critical health events based on said data insights.

8. The method of claim 6, further comprising enabling users to track their progress toward personalized health goals using said user interface.

ABSTRACT

INTERNET OF THINGS (IOT) BASED SMART HEALTH MONITORING SYSTEM WITH LONG RANGE (LORA) WIRELESS NETWORK

The present invention relates to a novel Internet of Things (IoT) based smart health monitoring system utilizing Long Range (LoRa) wireless network technology. The system enables real-time health data collection, transmission, and analysis, providing an efficient and cost-effective solution for remote health monitoring.