

**FORM 2**

THE PATENTS ACT, 1970  
(39 of 1970)  
AND  
THE PATENTS RULES, 2003

**COMPLETE  
SPECIFICATION**

(See Section 10; rule 13)

TITLE OF THE INVENTION

**IOT BASED REAL TIME HEALTH CARE SYSTEM ENABLED BY  
WEARABLE SENSOR NETWORK**

**APPLICANT**

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

# **IOT BASED REAL TIME HEALTH CARE SYSTEM ENABLED BY WEARABLE SENSOR NETWORK**

## **Field and background of the invention**

Rapid development of medical technology has paved way for health monitoring of elders. During this pandemic period of declining population priority issue all over the world is elderly caring. Now a day's most of them opt for abroad jobs and not in a situation to live the elders hence they live alone or they are sent to elder care institutions for better care of them and their health but still near ones are not aware of the regular happenings or health status of their elders. Technology provides a significant solution by providing nursing assistance using wearable devices without any human intervention.

Healthcare cost has reduced by the usage of wearable devices such as AppleWatch, Garmin, MI Band and smart clothes where Gramin is utilized for tracing steps count of the user along with their heart beat; smart clothes are able to detect physiological parameters, sleeping efficiency, user's attitude and their moving. These wearable devices are able to monitor the physiological parameters of the elders continuously in order to manage their health and transfer the data to their medical professionals and care takers based on which personalized medical care is provided to them. Software or User Application is used for collection of

data report such that the care taker is able to grasp immediately the health situation of their elders.

### **Summary of Invention**

In this invention, Wearable devices are utilized for monitoring the health status based on Internet of Things (IoT) which is a proactive care system able to generate notifications about the health status of elders. In our invention health watch and smart clothes are used for recording the attitude and physiological signs of the user. Medical professionals treating the users set the threshold values for their visitors such that the proposed system is able to generate alert notifications when the data collected by the wearable devices crosses the threshold values. These alert notifications are sent to user's family, medical professionals and the care takers of the users for tracking the health condition.

Users who are able to provide self care but under chronic disease can manage their health status by regular questionnaires provoked by the health system in order to remain the users about the timely medications. Data collected by the wearable devices are in the form of raw analog data which are then converted to accessible digital data indicating the vital signs. Then these vital signs are updated to the server providing the service. These vital signs are continuously monitored for any abnormality in the collected signals. Detection of any abnormal signal leads to generation of emergency notification which is then passed to the web page

and Application such that care takers at any location are informed to provide immediate attention and care to the users.

### **Brief description of the system**

- In this invention, IoT based health care is provided with notification service for the user to manage their health condition either by themselves or by caretakers. Wearable devices involved in the proposed system are health watch, smart clothes and body tag attached to the user.
- Smart clothes are made of conductive fiber for collecting electrocardiography (ECG) signals where these smart clothes are designed into different kinds based on the demand of the user such that the elders feel comfortable to wear the smart clothes.
- These smart clothes involves four electrodes with two electrodes on two shoulders of the user and two more electrodes on the two sides of the rib cages such that the electrodes are in contact with the skin directly.
- Healthy watch involves three sensors namely ECG sensor, photoplethysmography sensor and three axis acceleration sensor which is able to collect electrocardiogram signal, photoplethysmography signal and attitude signal for analyzing the parameters of the user.
- The system is able to analyze heart rate, change of concentration of blood oxygen, daily walking steps and sleep quality using these sensors.

- The system involves body tag consisting of gyroscope for analysis of walking steps.
- Three-axis accelerometer in the body tag is used for measuring the user attitude signal by which change in attitude of the user is analyzed.
- In order to operate in power saving mode, body tag operates in sleep mode whenever ends of the body tag are found non-conductive where the body tag is buckled on the smart clothes for monitoring attitude change of the user.
- BLE communicates to Wi-Fi gateway in three ways namely Transmission Control Protocol (TCP), Hypertext Transfer Protocol (HTTP) and Message Queuing Telemetry Transport (MQTT) protocol.
- We adopt TCP protocol in our system where the TCP socket is used for connecting the system and retrieval of BLE advertising data is done for abnormal warning and indoor positioning of the system.
- Wearable devices can be controlled by Bluetooth technology by automatically changing the measure mode of the gateway.
- System server involves web page, Android App, and Cloud where the raw data is updated to the Cloud for the server to analyze user data for generating graphical analysis report along with notification if any abnormality.

The invention is herein described, with the accompanying block diagrams.

Wherein: Figure 1. Proposed Architecture of IoT Based Elder Health Care System

Figure 2. Proposed Architecture of Health Care Notification System

### **Description of the system**

- This invention involves care notification system which comprises of three main functions namely measurement of abnormal physiological parameters, immediate emergency notification and personal health knowledge messages and questionnaires for the users able to provide self care themselves.
- First function involves updation of vital parameters such as heartbeat, blood pressure, uric acid and blood sugar by the users themselves such that the health care system is able to transmit abnormal physiological values through API format to the care notification system immediately.
- Decision is then taken by the care notification system whether to broadcast alert notification or not which depends on the set threshold value.
- Secondly immediate emergency notification is generated when heartbeat or breath is too slow or too fast to care takers very nearby to the users where the users are also provided with SOS button for immediate assistance.
- Transmission of Emergency code to the care system in API format sends emergency message to the care taker such as attendants or family members.

- Thirdly personal health related knowledge messages and questionnaires promoted actively by the system to the user for maintaining their health status such as daily diet, relevant exercises, life style to be practiced etc.
- Hence IoT facilitates devices to communicate in a smart way efficiently.

## **CLAIMS**

### **We Claim:**

1. IoT based health care system provides regular notification involving information on health status of the elder under care.
2. Wearable devices such as health watch, smart clothes and body tag collects raw information tracking the elders from remote locations.
3. Data on elders sleep quality; daily steps taken are noted to indicating their normality on the other hand frequency of their stay on bed indicates their abnormality.
4. Low power Bluetooth technology is utilizes for data transfer within home, hospital or health care centres while IoT is utilized for data transfer to remote locations.
5. Physiological signals are monitored continuously such that care takers are updated with health condition of elders.
6. Proposed invention provides improved efficiency and accuracy for better service quality of health management.

## **ABSTRACT**

Rapid growth of population along with their aging has led to major issue as health care of elders throughout the world. Technology plays significant role in improving the quality of care service along with decreased manpower burden at low cost. Several entrepreneurs from health care industry have started seeking the assistance of technology for solving the issue of elderly care. This invention proposes IoT (Internet of Things) based health care system using wearable devices for generating notification of any abnormalities. Physiological parameters are recorded by wearable devices such as body tag, smart clothes and health watch which collect raw data which is then updated to the database for generating the personal report of elder's health analysis. If any abnormal value above the threshold, then the care notification system generates alerts and sent to care takers of the elders. Health management of elders with high blood sugar and high pressure becomes feasible by this invention as the care takers are able to get regular notifications about the condition of the elders at low cost with higher accuracy compared to conventional systems.