Lifelogging Personal Data Based on Internet of Things Using Esp8266

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Abstract – There are number of applications offered by IoT. IoT provides an important contribution in the field of healthcare, its principles and properties are already being applied to improve access to healthcare, improve the quality of healthcare and most importantly reduce the cost of system. The technology is used for gathering, analyzing and transmitting data in the IoT continues to new innovative healthcare applications and systems. Wireless devices are involved in medical area with an wide range of capability. To monitor the patient's health details in periodic intervals necessary in existing technologies. To overcome this we have changed recent wireless sensor technologies. We gather the information like fall detection using Accelerometer, patient's temperature and their heartbeat. In general different sensors are used to gather patient's medical information without being injecting inside the body by this we are achieving monitoring and data gathering of patients. The doctor is not needed to visit the patient periodically. IoT provides new applications as well as efficient systems which helps to make an integrated healthcare system. The system provides better capability, healthcare system and costs are also reduced.

Index Terms – Accelerometer Sensor, Heartbeat Sensor, Temperature Sensor, ESP8266 chip.

1. INTRODUCTION

The concept "Internet of Things" becomes more useful in the field of medical and in industry. The building up of a globally interconnected continuum of variety of objects in the physical environments is the fundamental idea of IoT. IoT have generated a large number of opportunities in the industrial areas, particularly in the healthcare field. The heterogeneous sensors such as accelerometers. Altimeters, gyroscopes, temperature, pressure, humidity, UV radiation, radio frequency identification tags, and other portable low-cost devices are used in IoT. The IoT platform is connected with the heterogeneous medical devices to remotely monitor a patient's health this is due to the enormous growth of commercial wearable devices and mobile apps. Recently, many commercial products and mobile applications have been released for the long term record and collection of personal LPA. The most famous mobile apps, such as moves, are based on smartphone 3-D accelerometer data and GPS information which allows tracking user movement activities including location, distance and speed. The wearable product such as Fitbit Flex,Nike+Fuelband, Withings are all wristband devices that records steps count, distance and calories burnt. These devices communicate with mobile phone via Bluetooth employing relevant mobile applications. While above products have been proven in popularity among general users, their major usages are limited in the fitness fields. It is due to the diversity of life pattern and environmental impacts. The lifelogging personal data from individual wearable device exhibits remarkable uncertainties. The validating of these physical activity data in the healthcare cases is more challenging. To improve the validity of lifelogging data in an IoT enabled healthcare system, the Lifelogging Physical Activity (LPA) is used. This paper investigates the problem of effectively validating LPA in a heterogeneous device-based IoT enabled personalized healthcare environment. A rule-based adaptive LPA Validation model (LPAV), LPAV-IoT is proposed for the elimination of Irregular Uncertainties (IUs) and estimating the data reliability in IoT enabled personalized healthcare systems. It enables data validation procedure in IoT environments to be a dynamic standardized empirical analysis workflow with four layers including the factors, methodologies, knowledge and actions.

2. RELATED WORK

A set of interconnected devices [2] are used for IoT based personalized healthcare systems to observe and collect personalized health information from wearable sensing devices through a middleware. The middleware provides interoperability [3] and security of IoT [4] in the field of healthcare. These sensors are capable of recording heartbeat rate, temperature, position, physical activity, sleep, weight etc. For the long term record and collection of personal LPA many commercial wearable products [5], [6] and mobile applications [7], [8], [9] are released. The wearable products such as Nike+Fuelband, Fitbit Flex, Withings are used for recording steps count, distance and calories burnt. These wearable devices communicate with mobile phones via Bluetooth. The above products are popular among the general users but due to the diversity of life pattern [1] and environmental impacts, the wearable devices exhibits remarkable uncertainty. The validating of the physical activity data in longitudinal healthcare cases is more challenging. The heterogeneity and diversity of device connected in the IoT based personalized healthcare system will increase as in the exponential growth of mobile healthcare market and in the development of numerous similar wearable products.

The effective validation of LPA [10] becomes more difficult in the case of heterogeneous devices.

3. PROPOSED WORK

A rule-based LPA Validation model, LPAV-IoT is proposed for effectively eliminating IUs and estimating physical activity data reliability in IoT enabled personalized healthcare systems. A series of validation rules representing with uncertainty threshold parameters and reliability indicators are designed and evaluated through a set of experimental investigation. These rules are capable of being adaptively and dynamically updated regarding the needs of an IoT enabled personalized healthcare systems. The ecosystem for LPAV-IoT is the theoretical cornerstone of validation of physical activity in an IoT environment. The workflow of LPAV-IoT model for validating the physical activity is a dynamic recurrence by duration along the timeline. The validation rules are initiated by feeding a set of historical raw data in the LPAV-IoT model and are used to validate the current physical activity. Irregular Uncertainties occur randomly and accidently in LPA data. The causes of these uncertainties include device malfunctions or faults, breakdown of third party server, misuse of mobile apps and the sudden change of personal circumstances. The occurrence of IU will appreciably impact the efficiency and accuracy of assessing personal health.

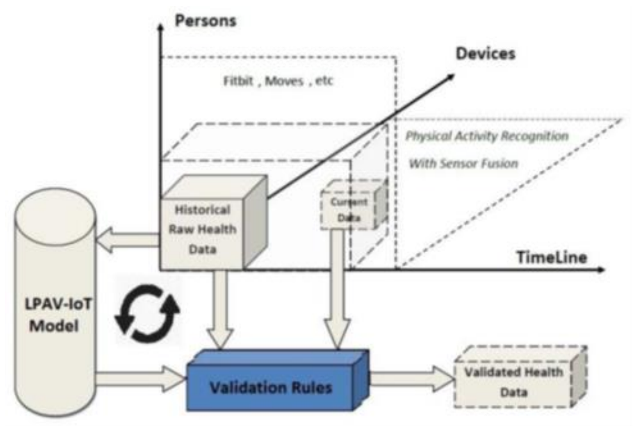

Fig.1. LPAV-IoT Architecture.

Regular Uncertainty(RU) occurs frequently and persistently in LPA data. The causes resulting in these uncertainties are mainly from some regular influencing issues like intrinsic sensor errors, differentiation of personal physical fitness and changes of environment. In the device factor modules, existing popular wearable devices are classified by sensory techniques such as GPS based, Accelerometer based and a combination of sensor based. The accuracy of these three sensory techniques for measuring position are quantified by means of relative error and standard deviation of the relative error through a series of experiments and are illustrated in the Fig.1.LPAV-IoT Architecture[2].

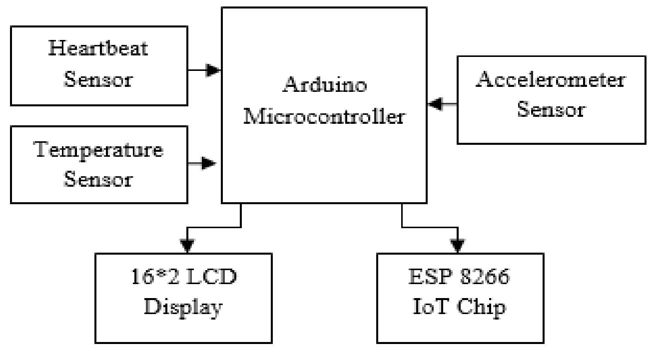

Fig.2. Block Diagram of LPAV-IoT model

3.1 COMPONENTS

Components are uniquely identifiable input part, piece, assembly or subassembly system or subsystem that is required to complete or finish an activity, performs a distinctive and necessary function in the operation of a system or in intended to be includes as a part of a finished and labeled item. Components are usually removable in one piece and are considered indivisible for a particular purpose or use. Various components are used for validating the personal data and are shown in Fig.2.

- Arduino Microcontroller
- Temperature Sensor
- Heartbeat Sensor
- Accelerometer Sensor
- ESP8266

3.1.1 Arduino Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs- light on a sensor, a finger on a button, activating a motor, turning on an LED. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you can use the Arduino programming language (based on Wiring) and the Arduino software (IDE) based on Processing. The diagrammatic representation of Arduino microcontroller is shown in Fig.3.

Fig.3. Diagrammatic representation of Microcontroller.

3.1.2 LCD

LCD(Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16*2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16*2 LCD means it can display 16 characters pFlatscreen LCD and plasma screens work in a completely different way. In a plasma screen, each pixel is a tiny fluorescent lamp switched on or off electronically. In an LCD television, the pixels are switched on or off electronically using liquid crystals to rotate polarized light, er line and there are two such lines. The representation of LCD is shown in Fig.4.

Fig.4. Diagrammatic representation of LCD

3.1.3 Heart-Beat Sensor

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart Beats Per Minute (BPM) is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin in the pulse. A heart rate monitor is a personal monitoring device that allows one to measure one's heart rate in real time or record the heart rate for later study. It is largely used by performers of various types of physical exercise and are illustrated in Fig.5.

Fig.5. Diagrammatic representation of heartbeat sensor.

3.1.4 Temperature Sensor

This is the latest DS18B20 1-Wire digital temperature sensor from Maxim IC. Reports degrees C with 9 to 12-bit precision, -55C to 125C (+/-0.5C). Each sensor has a unique 64- Bit Serial number etched into it- allows for a huge number of sensors to be used on one data bus. This is a wonderful part that is the corner stone of many data-logging and temperature control project. The diagrammatic representation of temperature sensor is shown in Fig.6.

Fig.6. A diagrammatic representation of temperature sensor.

3.1.5 Accelerometer

Analog Devices MEMS accelerometers offers highly accurate motion detection when measuring acceleration, tilt, shock and vibration in performance-driven applications. ADI's MEMS accelerometer portfolio leads the industry in power, temperature, noise and bandwidth performance. The single chip can do process such as data reception, storing, transfer of data. The accelerometer consists of bandwidth, number of axes, analog and digital, sensitivity and many other specifications. The type of output is the most important specification. The output of the accelerometer is a scalar corresponding to the magnitude of the accelerometer sensor and are illustrated in the Fig.7.

Fig.7. Diagrammatic representation of Accelerometer sensor.

3.1.5 ESP-8266

Your ESP8266 is an impressive, low cost WiFi module suitable for adding WiFi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone WiFi connected device – just add power. ESP8266 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of onchip integration allows for minimal external circuitry and the entire solution including front-end module is designed for occupy minimal PCB area. The diagrammatic representation of ESP chip is shown in Fig.8.

Fig.8. Diagrammatic representation of ESP8266 module.

In the healthcare field, due to significant population aging in the coming decades, IoT enabled technology is evolving healthcare from conventional hub-based system to personalized healthcare system. The successful utilization of LPAV-IoT model into practical will enable more accurate measure and monitoring of daily physical activity with low cost devices, further lead to faster and safer preventive care for chronic diseases. The research outcome is extremely valuable and benefit.

3.2 ALGORITHM

1. Start the program by initializing the ADC and initialize the digital format.
2. Begin the Baud rate for Communication and set the Baud rate as 9600.
3. Enable the continuous loop. Read the values of the Digital Thermometer Sensor.
4. After collecting the data, display the value in the lcd.
5. Read the values of Heart Beat Sensor. Place the finger in the probe of the heart beat sensor.
6. Wait for 5ms to read the data from the sensor. After collecting the data check whether the data is valid or not.
7. If the data is valid then display the value in lcd. If the value in invalid then display Error and check it again. Show both the value in the display.

4. PERFORMANCE EVALUATION

The IoT based health monitoring are used for monitoring the heartbeat, temperature and position of persons. The following chart represents the outcome of the lifelogging personal data.

The field chart shown in Fig.9 represents the heartbeat of a person for validating purpose. The values got from the device are updated frequently into the Thing Speak server and are shown in a chart format. The x-axis represents the date and the y-axis represents the heart beat rate. The Fig.10 represents the values of the temperature that are monitored from a person and are updated frequently in the chart. Here the x-axis represents the date and the y-axis represents the temperature. The value of the position are in string format so they are updated in the html page and are shown in the server. The html page contains all the three fields such as temperature, heart beat and the position of a person.

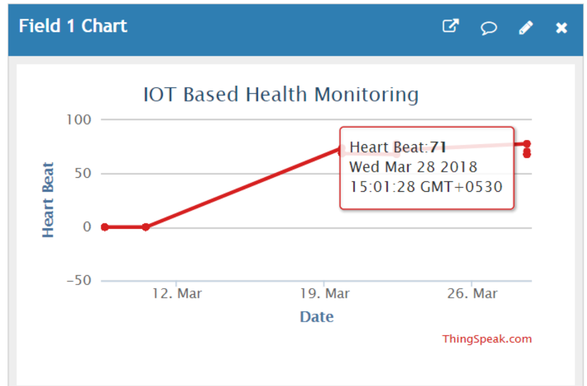

Fig.9 : Field Chart for Heartbeat Detection

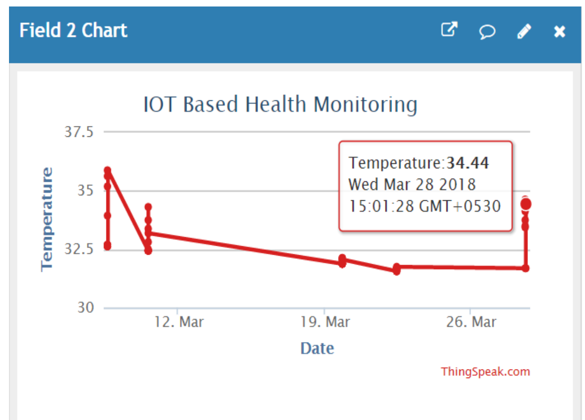

Fig.10 : Field Chart for Temperature Detection

The representation of monitoring patient's heartbeat, temperature and position is represented in Fig.11.

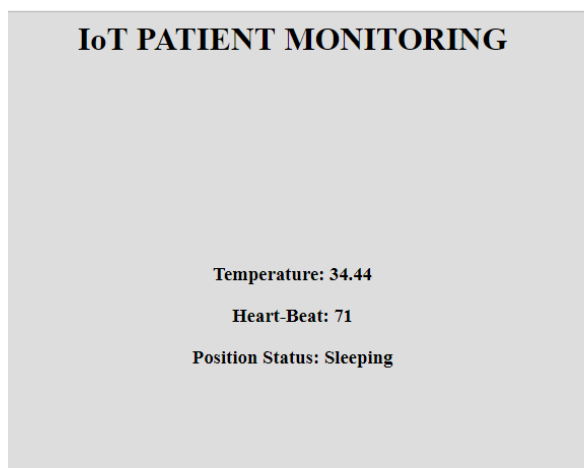

Fig.11 : Diagrammatic Representation of Patient Monitoring

5. CONCLUSION AND FUTURE WORK

Extensibility, Human Interaction and functional values are some of the issues for effectively validating the lifelogging personal data based on IoT enabled personalize healthcare system. These issues are needed to be discussed and are considered for the future work. A rule-based adaptive physical activity validation model, LPAV-IOT, is proposed for eliminating IUs and estimating data reliability in an IOT enabled personalized healthcare environment. By defining a set of uncertainty threshold parameters and reliability indicators, the validation rules are represented. The threshold parameters and reliability indicators are initiated by historical raw data and are dynamically updated regarding the needs of an IoT enabled personalized healthcare system. It offer approaches for effectively filtering the errors and reducing uncertainty of LPA data. The successful utilization of LPAV-IoT model into practical will enable more accurate measure and monitoring of daily physical activity with low cost devices further lead to faster and safer preventive care for chronic diseases. The research outcome is extremely valuable and benefit.

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