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STRUCTURAL HEALTH CARE MONITORING DEVICE USING IOT

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Abstract - Our main objective is to implement a wearable device which monitor the user healthcare parameters and their walking steps, Calories burned by the user. TCP/IP Connection is established for the wearable device to Monitoring the data in Web server and mobile application. The web server is a program uses HTTP to serve the files that constitute web-page for clients.the server system which is an IOT freeware platform is connected to the internet so that the structure can be monitored from remote places, the client system which run on embedded platform is also bridged to the mentioned internet. An efficient hardware module is connected to the structure which can be interface to MySQL Server to provide the sensory information. Instead of establishing the connection to the server using broadband ISP services, we are using WIFI module so that the system has higher throughput and is also cost efficient.Mobile application which send the message notification to hospital in case of emergency.

Keyword: Health monitoring, wireless sensor, wifi modules, Mobile application, MySQL server, webserver, internet of things.

INTRODUCTION

The Internet of Things is gaining popularity across all industries. The IOT is a Scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. In business, the IOT has immense opportunities to significantly improve decisions. Today, with almost every device being other device and communicating to each other, a huge net of connected things is being created. Most industries are starting to invest to leverage the benefits of the IOT.The spectrum of connected devices now spans from simple fitness wearable's to complex sleep trackers, and is stepping into the realm of medical devices.
Wearable devices are widely used for measuring personal fitness, managing busy schedules, and incorporating a healthy lifestyle, etc. At the same time, there are other innovations starting to happen in the areas where wearable devices could analyze medical conditions. On their own, these devices have limited usage, but when they are connected to each other and other systems, the potential that unfolds becomes immensely powerful. The IOT,

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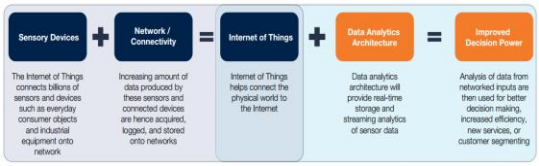
when coupled with data analytics, enhances decision-making power.

Sensory devices with access to networks are perfect example of what the IOT is and does (see Fig 1). Life insurers are using sensory devices for better risk assessment. These devices generate huge amounts of data as they communicate among themselves through the network. The benefit is that when the IOT is combined with data analytics architecture, the result is improved business intelligence to make more informed business decisions.

Figure 1:



The products developed based on IOT include embedded technology which allows them to exchange information, with each other or the Internet and it is assessed that about 8 to 50 billion devices will be connected by 2020. Since these devices come online, they provide better life style, create safer and more engaged communities and revolutionized healthcare.

The entire concept of IOT stands on sensors, gateway and wireless network which enable users to communicate and access the application /information. Be that as it may, among all the regions no place does the IOT offer more prominent guarantee than in the field of health awareness. As a saying goes "Health is wealth" it is exceptionally crucial to make utilization of the innovation for better wellbeing. Consequently it is obliged to add to an IOT framework which gives secure health awareness checking. So outlining a savvy medicinal services framework where client information is gotten by the sensor and sent to the cloud through Wi-Fi and permitting just approved clients to get to the information.

PROBLEM IDENTIFICATION

In Today's social insurance framework for patients who stays in home during post operational days checking is done either via overseer/medical caretaker. Ceaseless observing may not be accomplished by this system. The device gave the sensory information to the user mobile application using UI designs. So the user get their health parameters to take care of themselves.

SURVEY:

Refer [1] they used the BSN based modern healthcare system and transmitting the data through the wireless communication. In [2] they using the Zig Bee technology for transmitting the data to the database. In [3] they using the pic microcontroller as a gateway to communication over the different sensors and read the values.in [4] they proposed the platform has an intelligent medicine box that gives alert for patients to take their medicines at the the right time.[5] they notice the patient with possible precautionary measures to be practised by them.[6] they send the data to the server by the way of Ethernet cable shield attached to the Arduino board.[7] they using IRD pulse for measuring the patient heartrate.in[8] this paper they using the wired communication technology for transmitting the data to the data base.

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PROPOSED SYSTEM

'The main idea of the designed system is to continuous monitoring of the patients over internet and intimation will provide to the hospital in case of emergencysituation. The Proposed architecture for IOT Healthcare is as shown in fig.2. The Model consists of Arduino Unomicrocontroller, Temperature Sensor (MAX30205), Pulse / Heart rate senor (TCRT1000), ADXL Accelerometer sensor, Wifi module ESP8266 and Regulated Power supply. In this system Arduino Uno microcontroller collects the data from the sensors and sends the data through Wi-Fi protocol. The Protected data sent can be accessed anytime by the doctors by typing the corresponding unique ip address in any of the internet browser at the end user device(ex: Laptop, Desktop, Tablet, Mobile Phone).

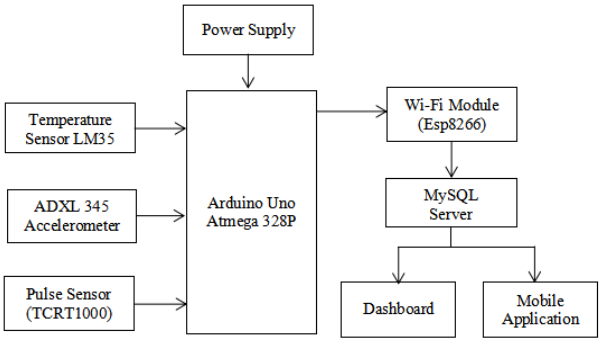

Figure 2: Proposed Block Diagram of IOT Based Healthcare Wearable Device

IMPLEMENTATION METHODOLOGY

Hardware Description

A) Arduino Uno (ATMEGA328P) Microcontroller

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino language is merely a set of C/C++ functions that can be called from your code. Your sketch undergoes minor changes (e.g. automatic generation of function prototypes) and then is passed directly to a C/C++ compiler.

B) Wi-Fi Module (ESP8266)

ESP8266 offers a self-standing Wi-Fi networking with TCP/IP protocol stack which can give Wi-Fi connection to any microcontroller.. ESP8266 when connected on-board it has storage and processing capabilities hence can be easily connected to the sensors based on the application.

C) Pulse Oximeter Sensor

Pulse oximetry is a simple technique to monitor the amount of haemoglobin that is oxygen saturated. Oximeter measures number of hearts beat per unit of time which is usually conveyed in bits per minute (Bpm). In the project MCP6004 based pulse oximeter is designed and TCRT1000 reflective IR optical sensor is used for

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photoplethysmography (PPG). Using TCRT1000 simplifies the process since both emitter and detector are arranged side by side. This technique is used to measure heart rate since change in blood volume is synchronous to heart beat.

D) Temperature Sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in oC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 oC temperature rise in still air.The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ oC.

E) ADXL345 Accelerometer Sensor

The ADXL345 is a small, thin, ultralow power, 3-axis accelerometer with high resolution (13-bit) measurement at up to ±16 g. Digital output data is formatted as 16-bit twos complement and is accessible through either a SPI (3- or 4-wire) or I2C digital interface. The ADXL345 is well suited for mobile device applications. It measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (3.9 mg/LSB) enables measurement of inclination changes less than 1.0°. Several special sensing functions are provided. Activity and inactivity sensing detect the presence or lack of motion by comparing the acceleration on any axis with user-set thresholds. Tap sensing detects single and double taps in any direction. Freefall sensing detects if the device is falling. These functions can be mapped individually to either of two interrupt output pins. An integrated memory management system with a 32-level first in, first out (FIFO) buffer can be used to store data to minimize host processor activity and lower overall system power consumption. Low power modes enable intelligent motion-based power management with threshold sensing and active acceleration measurement at extremely low power dissipation.

Software Description

A) Embedded C Programming

The language extension of C Programming is Embedded C, which was developed in order to address the common issues between C extensions for different embedded systems.

A) Arduino IDE

Arduino Integrated development environment is a software program runs on the Personal Computer for embedded microcontroller design.

RESULTS

Following Process goes on step by step when hardware is powered.

Step 1: Wi-Fi module established the connection to the router. After established IP address and port number will be displayed on the serial port

Step 2: Then configuration Settings is complete and system comes to online.

Step 3: Temperature sensor sense the temperature of the human body and display has “Temperature = VALUE”

Step 4: Next step is synchronizing of heart rate and it is indicated on Serial display has “SYNC

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HEARTRATE"heart rate data per minutes, Accelerometer sensor sense Speed,Distance, Steps and Calories burned by the user.

Step 5: The sensory data will stored in MySQL Server using Wi-Fi Module and the stored data will be displayed on the Web and Mobile application.

Step 6: When the Pulse rate gone to critical stage the message will be sent by the mobile application by default stored numbers in the database.

Conclusion:

The health parameters data are stored and published online. Hence, the healthcare professional can monitor their patients from a remote location at any time. Our system is simple. The Future work of the project is very essential in order to make the design system more advanced. In the designed system the enhancement would be connecting more sensors to internet which measures various other health parameters and would be beneficial for patient monitoring i.e. connecting all the objects to internet for quick and easy access. Establishing a Wi-Fi mesh type network to increase in the communication range.

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