SMART HEALTH MONITORING AND WARNING SYSTEM USING IOT

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ABSTRACT

Among the panoply of applications enabled by the Internet of Things (IoT), smart and connected health care is a particularly important one. Networked sensors, either worn on the body or embedded in our living environments, make possible the gathering of rich information indicative of our physical and mental health. (a) facilitate an evolution in the practice of medicine, from the current post facto diagnose-and treat reactive paradigm, to a proactive framework for prognosis of diseases at an incipient stage, coupled with prevention, cure, and overall management of health instead of disease, (b) enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individual, and (c) help reduce the cost of health care while simultaneously improving outcomes. In this paper, we highlight the opportunities and challenges for IoT in realizing this. In this proposed project we used Temperature sensor, Accelerometer and Pulse sensor to sense the temperature, position and pulse from the person and send them to the cloud. If the values exceed the specified conditions then the notifications are sent. Along with the notification the location of the person is sent through the message. The reports are generated by the values so that both person and the doctor can view the reports.

Keywords: Networked sensors, Internet of Things (IOT), Temperature sensor, Accelerometer, Pulse sensor

1. INTRODUCTION

Remote healthcare has become a vital service with the growing rate of senior citizens. Health monitoring, rehabilitation, and assisted living for the elderly and medically challenged humans is an emerging challenge because they require seamless networking between people, medical instruments, and medical and social service providers. This motivates the need for affordable, low-power, reliable, and wearable devices that will improve the quality of life for many elderlies and physically challenged people. The Internet of Things (IoT) platform offers a promising technology to achieve the aforementioned healthcare services and can further improve the medical service systems [1]. IoT wearable platforms can be used to collect the needed information of the user and its ambient environment and communicate such information wirelessly, where it is processed or stored for tracking the history of the user [2]. Such a connectivity with external devices and services will allow for taking preventive measure (e.g., upon foreseeing an upcoming heart stroke) or providing immediate care (e.g., when a user falls down and needs help).

Internet of Things (IOT) comprises things that have unique identities and are connected to the Internet. While many existing devices, such as networked computers or 4G-enabled mobile phones, already have some form of unique identities and are also connected to the Internet, the focus on IOT is in the configuration, control and networking via the Internet of devices or "things" that are traditionally not associated with the internet. These include devices such as thermostats, utility meters, a Bluetooth connected headset, irrigation pumps and sensors, or control-circuits for The applications of Internet of Things span a wide range of domains including

(but not limited to) homes, cities, environment, revolution in the capabilities of the end points that are connected to the Internet, and is driven by the advancement in energy, systems, retail, logistics, industry, agriculture and health as listed. For environment, IOT has applications such as weather monitoring, air and noise pollution, forest fire detection and river flood detection systems etc.

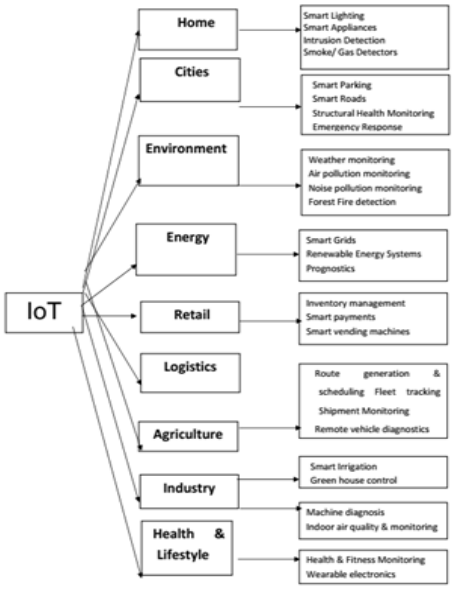
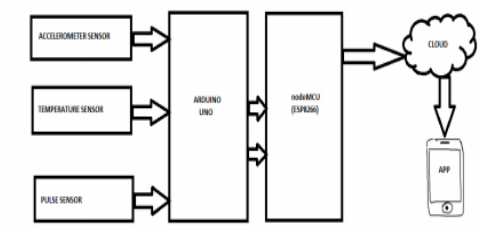


Figure: IOT Applications

2. ARCHITECTURE OF PROPOSED SYSTEM



The proposed system senses the temperature, position and pulse from the person and gives the analog voltage signal to the controller. The inbuilt ADC circuit converts analog voltage signal to digital and sends the data to the cloud. If the values exceed the specified conditions then the notifications are sent.

Along with the notification the location of the person is sent through the message.

2.1 ARDUINO UNO

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 ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features

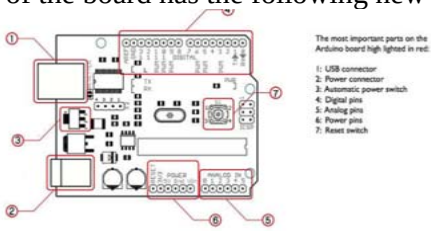


Figure: Block Diagram of Arduino UNO

2.2 Node MCU

NodeMCU is an open source IoT platform. It includes firmware, which runs on the ESP8266 SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. ESP8266 Wi-Fi SoC from Espressif Systems, and hardware, which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs. NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Expressif system began production of the ESP8266.The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

Features of NodeMCU:

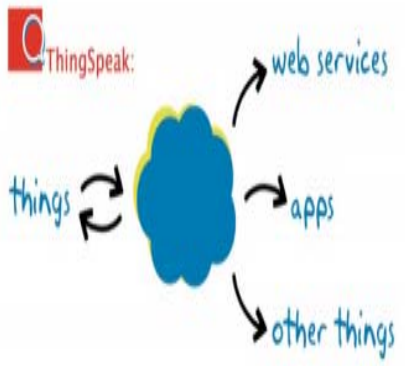
- Open-source
- Interactive
- Programmable
- Low cost
- Smart
- Simple
- WI-FI enabled

2.3 Cloud Computing:

Cloud computing is transformative computing paradigm that involves delivering applications and services over the Internet. Cloud computing

involves provisioning of computing, networking and storage resources on demand and providing these resources as metered services to the users, in a "Pay As You Go" model. Cloud computing resources can be provisioned on demand by the users, without requiring interactions with the cloud service provider. The process of provisioning resources is automated. Cloud computing resources can be accessed over the network using standard access mechanisms that provide platform=Independent access through the use of heterogeneous client platforms such as work stations Laptops tablets and Smart phones. The computing and storage resources provided by cloud service providers are pooled to serve multiple users using multi-tenancy. Multi- tenant aspects of the cloud allow multiple users to be served by the same physical hardware. Users are assigned virtual resources that run on top of the physical resources.

- Cloud computing services are offered to users in different forms
- **ThingSpeak** – an API and Web Service for the Internet of Things
- ThingSpeak, an "Application Programming Interface" (API) and web service for the "Internet of Things" (IoT).The ThingSpeak API is an open source interface which listens to incoming data, timestamps it, and outputs it for both human users (through visual graphs) and machines (through easily parse-able code). We look into practical examples using the Arduino micro-controller as well as communication with graphical interface operating systems through a Python script. Our report concludes that ThingSpeak is especially useful for smaller hardware projects where connectivity over the Internet is required but in which the maintenance of a dedicated communication server is not practical. Alternative IoT services exist but tend to require payment for some of their functionality and are consequently not open source

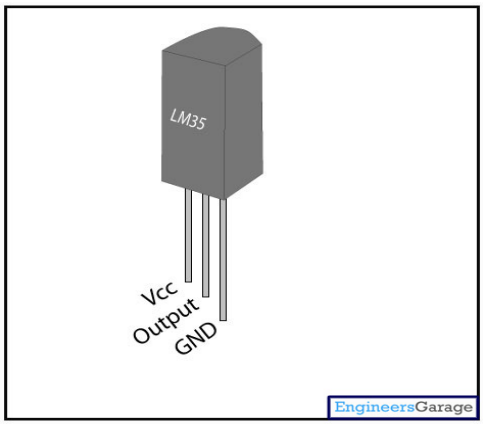


3.Temperature Sensor and Accelerometer

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 possesses 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

FIGURE: Pin Diagram of LM35 Temperature sensor



Accelerometer (ADXL335)

General description

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can

be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package.

The ADXL335 is a complete3-axis acceleration measurement system. TheADXL335hasameasurementrangeof±3*g*min i- mum. It contains a polysilicon surface-micromachined sensor and signal conditioning circuitry to implement an open-loop acceleration measurement architecture. The output signals are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration.

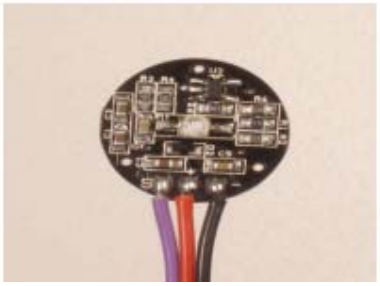
3. 1. Pulse sensor

Heart rate data can be useful whether you are designing an exercise routine, studying your activity or anxiety levels or just want your shirt to blink with your heart beat. The problem is that heart rate can be difficult to measure.

The Pulse Sensor Amped is a plug-and-play heart-rate sensor for Arduino. Students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heartrate data into their projects can use it. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. Also, it sips power with just 4mA current draw at 5V so it's great for mobile applications.

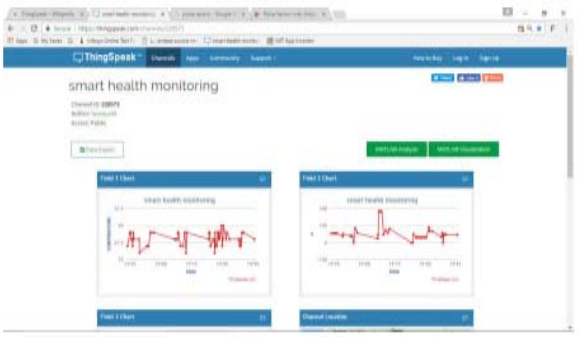
Diameter	= 0.625" (~16mm)
Overall thickness = 0.125" (~3mm)	
Cable length	= 24" (~609mm)
Voltage	= 3V to 5V

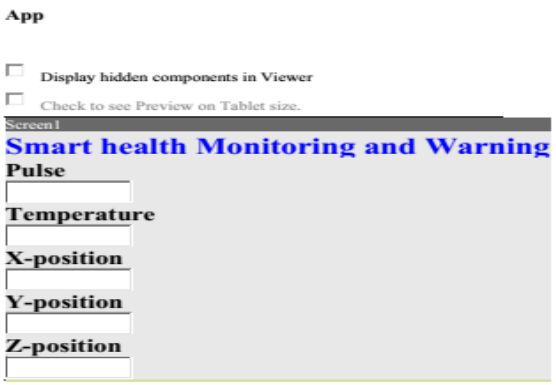
Current consumption = ~4mA at 5V

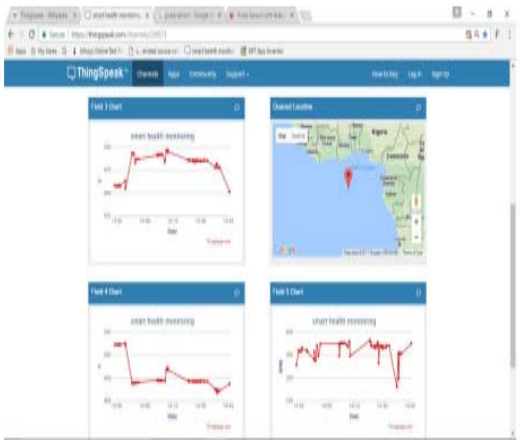


4. RESULT

The data in NodeMCU is displayed on Thing Speak. These graphs indicate the value of different sensors.







5. CONCLUSION

This system monitors the health condition of the patient continuously. Both Arduino UNO and NodeMCU are used. A micro controller;

ATmega328 is used as main control element.
Used IoT for exchanging the information.
Performed the process of cloud computing using thingspeak platform.

6.FUTURE SCOPE

- One of the major advantages of this technological innovation is the ability for an IoT device to be tested and diagnosed remotely.
- Internet of Things ensures better inventory management in hospitals and healthcare organisations.
- Healthcare institutions need to ensure optimum utilization of resources to maximise patient care to the fullest of their abilities

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