Heartbeat Detection and Monitoring Using IOT

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Abstract – This paper reviews the emerging research into exploitation of heartbeat data as a biometric for human identification. A variety of methods have been proposed for acquiring heartbeat signatures and a range of processing methods has been examined. We approach the biometric identification and verification problem by characterizing the three major factors affecting performance: individual variants, environmental variants, and sensor variants. The ability to collect and process the signal, exploit the data for individual identification or verification, and disseminate the information depends on all three of these factors.

1. INTRODUCTION

Heart is the most important component of the cardiovascular system. It weighs around 250–350 grams i.e. about the size of a fist. It beats around 2.5 billion times during as lifespan of 66–68 years. The heart is electrically stimulated by a special unit called Sino atrial node. This region produces a definite potential and slowly discharges, thus sending an electrical impulse across the atria. This electrical impulse is very sequential in nature and responsible for the systole and diastole in the four chambers respectively. Late years have seen a rising enthusiasm for wearable sensors and today a few gadgets are industrially accessible for individual human services, fitness, and movement mindfulness. Notwithstanding the specialty recreational fitness field taken into account by ebb and flow gadgets, analysts have additionally considered uses of such advancements in clinical applications in remote wellbeing checking frameworks for long haul recording, administration and clinical access to patient's physiological data. In light of current innovative patterns, one can promptly envision a period sooner rather than later when your routine physical examination is gone before by a two-three-day time of constant physiological observing utilizing reasonable wearable sensors. This monitoring system fulfills the basic needs of pervasive healthcare for heart diseases, also takes the cost into consideration to ensure the pervasive mode as economical as possible. Furthermore, it can also be combined with real-time analysis algorithms to assess patients' health condition and give warnings to potential attacks in advance, which can make the pervasive healthcare more intelligent.

2. INTERNET OF THINGS

The Internet of things (stylized Internet of Things or IoT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications.

An IoT-enabled intelligent system of uch cases has been demonstrated by the NSF Industry/University Collaborative Research Center for Intelligent Maintenance Systems (IMS) at University of Cincinnati on a band saw machine in IMTS 2014 in Chicago. Band saw machines are not necessarily expensive, but the band saw belt expenses are enormous since they degrade much faster. However, without sensing and intelligent analytics, it can be only determined by experience when the band saw belt will break. The developed prognostics system will be able to recognize and monitor the degradation of band saw belts even if the condition is changing, so that users will know in near real time when is the best time to replace band saw. This will significantly improve user experience and operator safety and save costs on replacing band saw belts before they actually break. The developed analytical algorithm was realized on a cloud server and was made accessible via the Internet and on mobile devices. The system will likely be an example of event driven architecture, bottom-up made (based on the context of processes and operations, in real-time) and will consider any subsidiary level. Therefore, model driven, and functional approaches will coexist with new ones able to treat exceptions and unusual evolution of processes (multiagent systems, BADSc, etc.). Integration with the Internet implies that devices will use an IP address as a unique identifier. However, due to the limited address space of IPv4 (which allows billion unique addresses), objects in the IoT will have to use IPv6 to accommodate the extremely large address space required. Objects in the IoT will not only be devices with sensory capabilities, but also provide actuation capabilities (e.g., bulbs or locks controlled over the Internet).To a large extent, the future of the Internet of things will not be possible without the support of IPv6; and consequently the global adoption of IPv6 in the coming years will be critical for the successful development of the IoT in the future.

3. THE ARDUINO UNO BOARD

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. It's an open source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

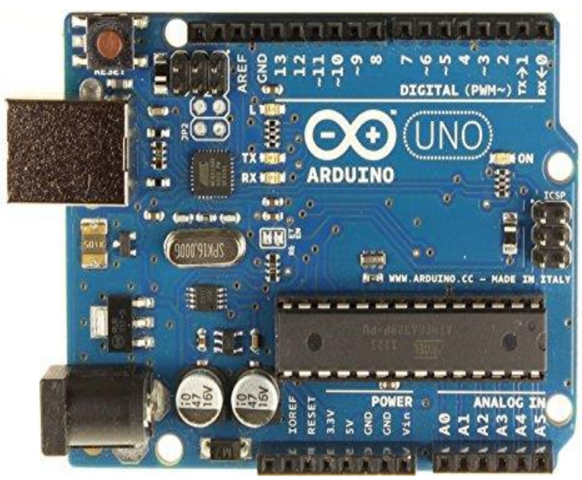


FIGURE 1 THE ARDUINO BOARD

4. PULSE SENSOR

A Heartbeat sensor is a monitoring device that allows one to measure his or her heart rate in real time or record the heart rate for later study. It provides a simple way to study the heart function. This sensor monitors the flow of blood through the International Journal of Engineering Science and Computing, April 2017 6665 http://ijesc.org/ finger and is designed to give digital output of the heartbeat when a finger is placed on it. When the sensor is working, the beat LED flashes in unis on with each heartbeat. This digital output can be connected to the microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse. The Pulse Sensor is a well-designed plug and play heart rate sensor for Arduino. It also includes an open source monitoring app that graphs your pulse in real time.

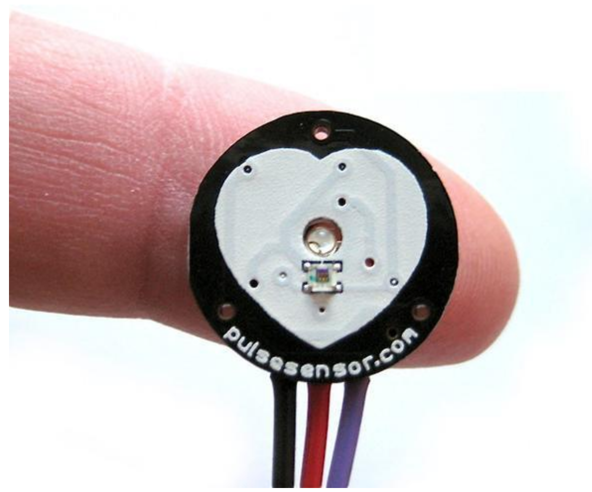
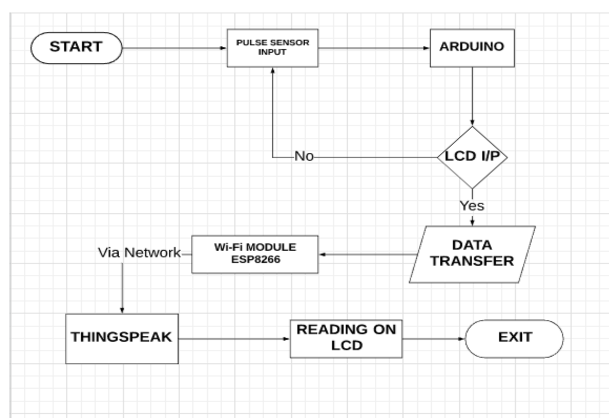


FIGURE 2 PULSE SENSOR

5. SYSTEM ARCHITECTURE

The general architecture of IoT applications can be divided into three layers: the sensing layer, the transport layer and the application layer. This kind of architecture is clear and flexible enough for our monitoring system, thus we design the system architecture based on that general model. Figure 1 shows the architecture of the IoT-based monitoring system for heart diseases patients.



FIUGURE 3 SYSTEM ARCHITECTURE

6. SYSTEM IMPLEMENTATION

First, we need to attach the Pulse Sensor to any organ of body where it can detect the pulse easily like finger. Then the Pulse Sensor will measure the change in volume of blood, which occurs when every time heart pumps blood in the body. This change in volume of blood causes a change in the light intensity through that organ. The Arduino will then convert this change into the heart beat per minute (BPM). The LED connected at pin 13 will also blink according the Heart Beat. The ESP8266 will then communicate with the Arduino and will send the data to ThingSpeak. The ESP8266 will connect the network to the router and user will provide in the code and will send the data of the sensor online. This data on the ThingSpeak will be shown in a Graph form showing the past readings too and can be accessed from anywhere over internet. The LCD connected will also show you the BPM.

7. CONCLUSION

In These days we have an increased number of heart diseases including increased risk of heart attacks. Our proposed system user's sensors that allow to detect heart rate of a person using heartbeat sensing even if the person is at home. The sensor is then interfaced to a microcontroller that allows checking heart rate readings and transmitting them over internet. The user may set the high as well as low levels of heart beat limit. After setting these limits, the system starts monitoring and as soon as patient heart beat goes above a certain limit, the system sends an alert to the controller which then transmits this over the internet and alerts the doctors as well as concerned users. Also, the system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus, concerned ones may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time. In our proposed research, we tried to propose a complete paper for detecting heart attack using two ways. However, we have some plan about this research.

Time of India, a leading newspaper in India published that "Researchers in the United States, within the next decade Heart Microeconomic Microchip will be set in blood vessel of human body. The smart phone will collect data and send the information to us". Researchers are trying to implement the requirements of Microchip for uses of the technology in smart phone. We will try to use this technology in future. If this technology will be developed, then we can detect heart blockage through this technology by our project.

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