



Efficient Bio Signals Monitoring System using Wireless Sensors

C.Karpagavalli M.E¹, J. Esther Rani², J.Santhiya³, G.Sajitha⁴
Assistant Professor¹, BE Student^{2,3,4}

Department of Computer Science and Engineering
St.Mother Theresa Engineering College, India

Abstract:

This research aim to increase a smart fitness monitoring machine with net of component (IoT). The system turned into designed for accumulating information on health thru wearable tool the use of API era. This undertaking, offers an IOT (net of factors) for tracking sufferers physiological situations constantly the usage of IoT. The gadget turned into designed to be a web and cellular utility. Here the physiological conditions of the sufferers are obtained via sensors and the output of these sensors is transmitted to net web page the usage of IOT kit. Android studio became used to broaden cellular software. The primary system of the device is that the sensors are used to measure heart price and step walked by means of human frame using bio sensors. The final manner is from android app immediately receiving sensor information from web page. The outcomes show that the system provided the user profile web page for editing person statistics. The system additionally provides simple fitness recommendation to users thru cell utility.

I. INTRODUCTION

The internet of factors (IoT) is an essential topic in era enterprise, policy, and engineering circle and has turn out to be headline news in both the strong point press and the popular media. This era is embodied in a extensive spectrum of networked in some systems such as, merchandise, systems, and sensors, which take benefit of improvements in computing power, electronics miniaturization, and community interconnections to offer new skills not previously feasible. An abundance of meetings, reviews, and information articles talk and debate the potential effect of the IoT revolution from new market possibilities and commercial enterprise fashions to issues about protection, privacy, and technical interoperability. It is essentially connecting the electronic items to the cloud and in different words internet with the intention to cause them to greater beneficial and worthwhile. The huge-scale implementation of IoT gadgets guarantees to convert many components of the manner we stay. For purchasers, new IoT products like net-enabled home equipment, domestic automation additives, there are many makes use of to family people and strength management gadgets are shifting us closer to a imaginative and prescient of the clever domestic, imparting extra safety and electricity efficiency. different private IoT gadgets like wearable health and health tracking devices and network enabled clinical devices are remodeling the way healthcare offerings are added. This era guarantees to be useful for human beings with disabilities and the aged, allowing progressed tiers of independence and exceptional of existence at an inexpensive price. IoT structures like networked cars, intelligent traffic structures, and sensors embedded in roads and bridges flow us towards the idea of smart towns, which assist limit congestion and strength consumption. IoT technology gives the possibility to convert agriculture, enterprise, and energy manufacturing and distribution by means of growing the supply of records along the fee chain of production the use of networked sensors. There are plenty of sensors on this digital international the usage of IoT we can cause them to greater worthwhile than ever. But, IoT increases many troubles and challenges that need to be taken into consideration and addressed in order for

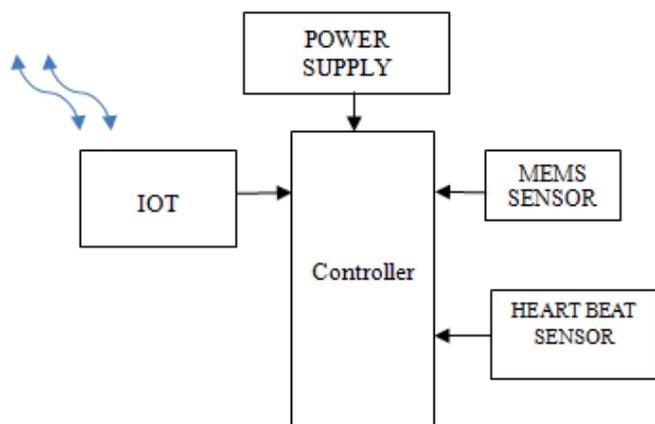
potential benefits to be found out. IoT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors. There are lots of sensors in this electronic world using IoT we can make them more worthwhile than ever. However, IoT raises many issues and challenges that need to be considered and addressed in order for potential benefits to be realized.

II. HELPFUL HINTS

- **Pervasive Connectivity**— Low-cost high-speed, pervasive network connectivity, especially through licensed and unlicensed wireless services and technology, makes almost everything “connectable”.
- **Widespread adoption of IP-based networking**— IP has become the dominant global standard for networking, providing a well-defined and widely implemented platform of software and tools that can be incorporated into a broad range of devices easily and inexpensively.
- **Computing Economics**—Driven by industry investment in research, development, and manufacturing, Moore’s law continues to deliver greater computing power at lower price points and lower power consumption.
- **Miniaturization**— Manufacturing advances allow cutting -edge computing and communications technology to be incorporated into very small objects. Coupled with greater computing economics, this has fueled the advancement of small and inexpensive sensor devices, which drive many IoT applications.
- **Advances in Data Analytics**— New algorithms and rapid increases in computing power, data storage, and cloud services enable the aggregation, correlation, and analysis of vast quantities of data; these large and dynamic datasets provide new opportunities for extracting information and knowledge.
- **Rise of Cloud Computing**— Cloud computing, which leverages remote, networked computing resources to process, manage, and store data, allows small and

distributed devices to interact with powerful back-end analytic and control capabilities.

III. ARCHITECTURE DIAGRAM



IV. PROPOSED WORK

The proposed system has been designed to take several inputs to measure physiological parameters of human such as heart rate and step walked. The inputs from the sensors are integrated and processed. The results are sent through the IOT Module to web page, which stores the data into an Access Database. From web page data collected using android app. The values can then be displayed on the Graphical User Interface (GUI) running on a mobile. If it is inferred that the person is medically distressed, an alarm may be generated. Once the user has connected to the receiver unit, data is automatically updated on the screen. Beats per minute (BPM), step walked and calories burned is given on the display. The system has been designed to take several inputs to measure physiological parameters of human such as heart rate and step walked. The inputs from the sensors are integrated and processed. The results are sent through the IOT Module to web page, which stores the data into an Access Database. From web page data collected using android app. The values can then be displayed on the Graphical User Interface (GUI) running on a mobile. If it is inferred that the person is medically distressed, an alarm may be generated. Once the user has connected to the receiver unit, data is automatically updated on the screen. Beats per minute (BPM), step walked and calories burned is given on the display. A power supply provides components with electric power. The term usually pertains to devices integrated within the component being powered. For example, computer power supplies convert AC current to DC current and are generally located at the rear of the computer case, along with at least one fan. This circuit is worn to renovate the AC to DC. It restrains of step down transformer, bridge rectifier, ripple filter, voltage regulator and line filter. Rationale of transformer is to step down the 230 VAC to 15VAC. This AC voltage is auxiliary rectified using bridge rectifier, the productivity of bridge rectifier is pulsating DC with small AC ripples. This AC ripples are then filtered using 1000uF shunt capacitor. Because the capacitor grounds AC signal and evade the DC, so the output across the shunt capacitor is pure DC. This DC voltage is unfettered, because change in primary of the transformer will change this DC voltage. So it needs to regulate the voltage. Here we use series voltage regulator is used to regulate the voltage. At last one 10uF shunt capacitor is used to filter the fluctuation due to switching of SCR's.

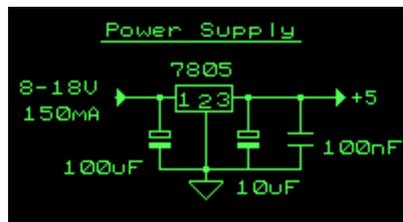


Fig 1 Circuit diagram of the power supply.

This circuit is a small +5V power supply, which is useful when experimenting with digital electronics. Small inexpensive wall transformers with variable output voltage are available from any electronics shop and supermarket. Those transformers are easily available, but usually their voltage regulation is very poor, which makes them not very usable for digital circuit experimenter unless a better regulation can be achieved in some way. The following circuit is the answer to the problem. This circuit can give +5V output at about 150 mA current, but it can be increased to 1 A when good cooling is added to 7805 regulator chip. The circuit has over overload and terminal protection.

V. TOOLS AND TECHNOLOGY

A. Heartbeat Sensor

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 is the pulse.

Principle of Heartbeat Sensor

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

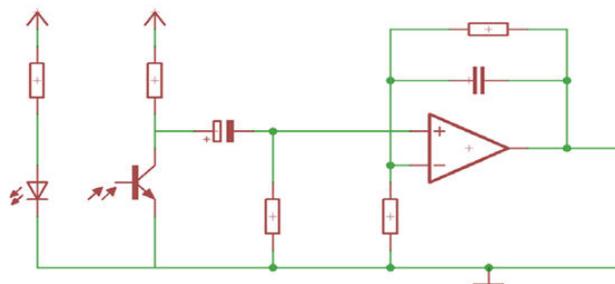


Figure. 2. Diagram of heart beat sensor

Working of a Heartbeat Sensor

The basic heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate. This signal is actually a DC signal relating to the tissues and the blood volume and the AC component synchronous with the heart beat and caused by pulsatile changes in arterial blood volume is superimposed on

the DC signal. Thus the major requirement is to isolate that AC component as it is of prime importance.

$$\text{BPM (Beats per minute)} = 60 * f.$$

Where f is the pulse frequency.

B. MEMS

Micro electro mechanical systems (MEMS) are a class of devices characterized both by their small size and the manner in which these are made. These are made up of component sizes between 1 and 100 micro meters. MEMS devices can vary from simple structures to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. Micro-Electro-Mechanical Systems, or MEMS, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of micro fabrication. The critical physical dimensions of MEMS devices can vary from well below one micron on the lower end of the dimensional spectrum, all the way to several millimeters. Likewise, the types of MEMS devices can vary from relatively simple structures having no moving elements, to extremely complex electromechanical systems with multiple moving elements under the control of integrated microelectronics. The one main criterion of MEMS is that there are at least some elements having some sort of mechanical functionality whether or not these elements can move. The term used to define MEMS varies in different parts of the world. In the United States they are predominantly called MEMS, while in some other parts of the world they are called "Microsystems Technology" or "micro machined devices".

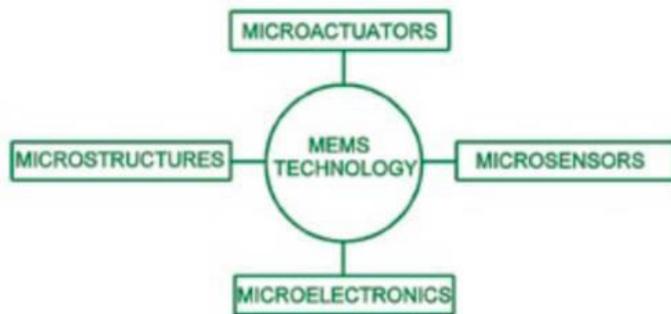


Figure. 3. Common block diagram of MEMS

Generally, MEMS consist of mechanical microstructures, micro actuators, micro sensors and microelectronics in one package.

C. PIC Microcontroller

PIC microcontrollers are a family of specialized micro controller chips produced by Microchip Technology in Chandler, Arizona. The acronym PIC stands for "peripheral interface controller," although that term is rarely used nowadays. A microcontroller is a compact microcomputer designed to govern the operation of embedded systems in motor vehicles, robots, office machines, medical devices, mobile radios, vending machines, home appliances, and various other devices. A typical microcontroller includes a processor, memory, and peripherals. The name initially referred to Peripheral Interface controller. It is low cost, Wide availability, large user base, extensive collection of application notes, availability of memory compatibility.

D. Android Application

Android apps can be written using Kotlin, Java, and C++ languages. The Android SDK tools compile your code along with any data and resource files into an APK, an Android package, which is an archive file with an .apk suffix. One APK file contains all the contents of an Android app and is the file that Android-powered devices use to install the app. An app can request permission to access device data such as the user's contacts, SMS messages, the mountable storage (SD card), camera, and Bluetooth. The user has to explicitly grant these permissions.

- Each Android app lives in its own security sandbox, protected by the following Android security features:
- The Android operating system is a multi-user Linux system in which each app is a different user.
- By default, the system assigns each app a unique Linux user ID (the ID is used only by the system and is unknown to the app). The system sets permissions for all the files in an app so that only the user ID assigned to that app can access them.
- Each process has its own virtual machine (VM), so an app's code runs in isolation from other apps.
- By default, every app runs in its own Linux process. The Android system starts the process when any of the app's components need to be executed, and then shuts down the process when it's no longer needed or when the system must recover memory for other apps.

E. Web page:

Web pages are what make up the World Wide Web. These documents are written in HTML (hypertext markup language) and are translated by your Web browser. Web pages can either be static or dynamic. Static pages show the same content each time they are viewed. Dynamic pages have content that can change each time they are accessed. These pages are typically written in scripting languages such as PHP, Perl, ASP, or JSP. The scripts in the pages run functions on the server that return things like the date and time, and database information. All the information is returned as HTML code, so when the page gets to your browser, all the browser has to do is translate the HTML. In the dashboard, the smart monitoring system gets activated and provide a result based on the workout of the users. The heart rate, average walk, average walk speed, and average calories are displayed in the dashboard.

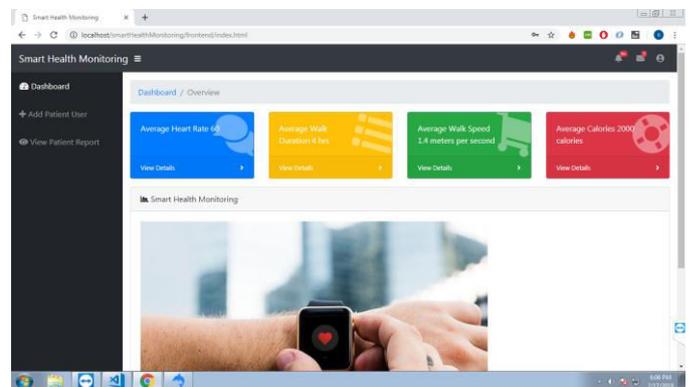


Figure. 4. Dashboard of the monitoring system

The user's heart rate, walking Duration, walking speed get calculated through this application. The IOT is used to monitor all the data of the patients. Finally, they can generate a report based on their workouts and health conditions

User ID	Heart Rate	Walk Duration	Walk Speed
1	22	22	42
1	22	22	42

figure.5. Monitoring the patient health condition through IOT

VI. COCLUSION

Smart health monitoring system with IoT is a system that collects health data. Using the method of health recording with wearable devices and basic health recommendation of user. Recording data from the device to collect and data were analysis using Rapid Miner this is a specialized program of data analysis or as we call it data mining. The algorithm used is Rule Induction to find accuracy and relationship of data. After that, the rule is model. To provide basic health recommendation to users via mobile and web application. The system could help the users to monitor their health information and use the recommendation from the system for their healthy in daily life. IOT based bio-signal monitoring is emerging as a significant element of next generation healthcare services.

VII. REFERENCES

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