

# International Journal of Innovative Research in Science, Engineering and Technology

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## Health Monitoring System Using Internet of Things and Wireless Sensor Networks

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**ABSTRACT** -In an IoT system, all of the sensors directly send their information to the internet. For example, a sensor may be used to monitor the temperature of a body of water. In this case, the data will be immediately or periodically sent directly to the internet, where a server can process the data and it can be interpreted on a front-end interface. Conversely, in a WSN, there is no direct connection to the internet. Instead, the various sensors connect to some kind of router or central node. A person may then route the data from the router or central node as they see fit. That being said, an IoT system can utilize a wireless sensor network by communicating with its router to gather data. A wireless sensor network as more of a group of sensors or "a big sensor" and less like a "competitor" or "rival" to the Internet-of-Things.

**KEYWORDS:** IOT, Sensor, WSN, node, Central Node

### I. INTRODUCTION

IoT exists at a higher level than WSN. In other words, WSN is often a technology used within an IoT system. A large collection of sensors, as in a mesh network, can be used to individually gather data and send data through a router to the internet in an IoT system.

It's also important to note that the term "wireless sensor network" is not nearly as encompassing as "the internet of things." WSN consists of a network of only wireless sensors. If the network was to include a wired sensor, it could no longer be labeled a "wireless sensor network." This is unlike IoT. Essentially any device that connects to the internet can be considered an IoT device. An "IoT system" can therefore be interpreted as a group of many IoT devices.

#### Examples

- A fridge with the capability of sending temperature reading to the internet is unlikely to use a wireless sensor network but it IS an IoT device. A large collection of sensors used to monitor precipitation on an acre of land is likely to be considered a "wireless sensor network" if in fact all the sensors are wireless. This system may or may not be connected to an IoT system.

### II. CHARACTERISTICS OF WSN

The main characteristics of a WSN include

Power consumption constraints for node using batteries or energy harvesting.

Ability to cope with node failures (resilience)

Some mobility of nodes (for highly mobile nodes see MWSNs)

Heterogeneity of nodes

Homogeneity of nodes

Scalability to large scale of deployment

Ability to withstand harsh environmental conditions

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Ease of use  
Cross-layer optimization

### III. HARDWARE

One major challenge in a WSN is to produce low cost and tiny sensor nodes. There are an increasing number of small companies producing WSN hardware. Many of the nodes are still in the research and development stage, particularly their software. Also inherent to sensor network adoption is the use of very low power methods for radio communication and data acquisition.

In many applications, a WSN communicates with a Local Area Network or Wide Area Network through a gateway. The Gateway acts as a bridge between the WSN and the other network. This enables data to be stored and processed by devices with more resources, for example, in a remotely located server. A wireless wide area network used primarily for low-power devices is known as a Low-Power Wide-Area Network (LPWAN).

### IV. WIRELESS

There are several wireless standards and solutions for sensor node connectivity. Thread and ZigBee can connect sensors operating at 2.4 GHz with a data rate of 250kbit/s. Many use a lower frequency to increase radio range (typically 1 km), for example Z-wave operates at 915 MHz and in the EU 868 MHz has been widely used but these have a lower data rate (typically 50 kb/s). The IEEE 802.15.4 working group provides a standard for low power device connectivity and commonly sensors and smart meters use one of these standards for connectivity. With the emergence of Internet of Things, many other proposals have been made to provide sensor connectivity. LORA is a form of LPWAN which provides long range low power wireless connectivity for devices, which has been used in smart meters. Wi-SUN connects devices at home. NarrowBand IOT and LTE-M can connect up to millions of sensors and devices using cellular technology.

### VI. WSN AND IOT IN HEALTH CARE MONITORING

There are several types of sensor networks for medical applications such as implanted, wearable, and environment-embedded. Implantable medical devices are those that are inserted inside the human body. Wearable devices are used on the body surface of a human or just at close proximity of the user. Environment-embedded systems employ sensors contained in the environment. Possible applications include body position measurement, location of persons, overall monitoring of ill patients in hospitals and at home. Devices embedded in the environment track the physical state of a person for continuous health diagnosis, using as input the data from a network of depth cameras, a sensing floor, or other similar devices. Body-area networks can collect information about an individual's health, fitness, and energy expenditure. In health care applications the privacy and authenticity of user data has prime importance. Especially due to the integration of sensor networks, with IoT, the user authentication becomes more challenging; however, a solution is presented in recent work.

Generally, it is very hard to find the abnormalities in the heartbeat count of a patient. The average count of 25 years old ranges from 140 to 170 beats/minute, whereas in 60 years old people, it ranges from 115 to 140 beats /minute. Patients are not satisfied with the treatment which doctors normally use for finding the heartbeat count. So there should be a device to track the internal changes in the human body. There are different types of instruments are available in the market to track internal body changes, but there are some limitations due to their heavy cost, maintenance, instrument size, and the patient's mobility Here is a device namely wireless health monitoring system used to overcome this problem like easy to use, small in size, lightweight and portable. This device uses a heartbeat sensor to track the patient's heartbeat count and also abnormalities.

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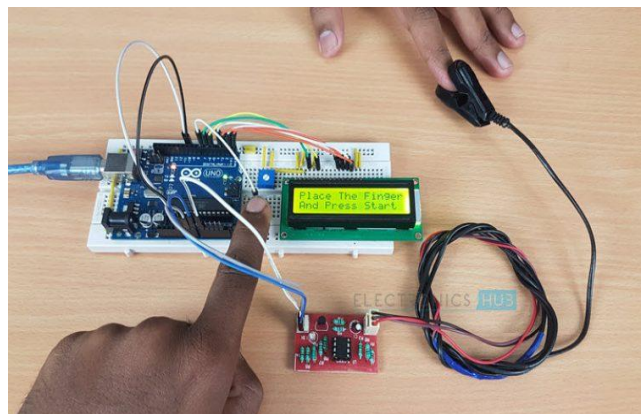
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## Automatic Wireless Health Monitoring System

Nowadays, health care sensors are playing an essential role in hospitals. The patient monitoring system is one of the major developments because of its innovative technology. An automatic wireless health monitoring system is used to measure a patient's body temperature and heartbeat by using embedded technology. The proposed system uses both sensors like heartbeat sensor and a temperature sensor. These sensors mainly involve monitoring the condition of the patient.

Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heartbeat. This digital output can be connected to 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.



**Fig 1:** Heartbeat Sensor using Adriano (Heart Rate Monitor)

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy.

In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure.

Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or neck and the other way is to use a Heartbeat Sensor.

## VI. FEATURES

Microcontroller based SMD design

Heart beat indication by LED

Instant output digital signal for directly connecting to microcontroller

Compact Size

Working Voltage +5V DC

Applications

Digital Heart Rate monitor

Patient Monitoring System

Bio-Feedback control of robotics and applications

Output checking on scope for reference below.

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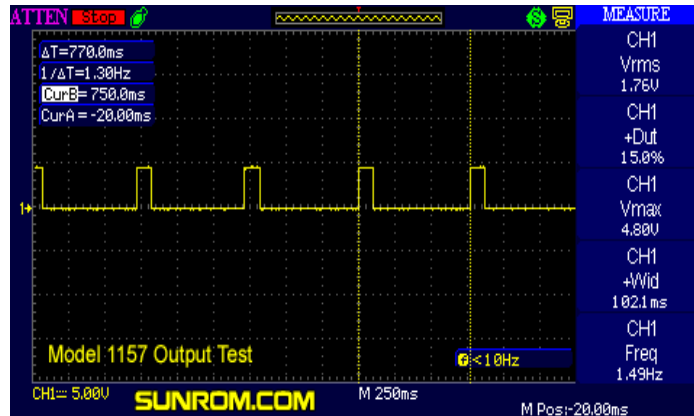


Fig 2: Model 1157 Output Test

The output is digital level at around 5V supply.

The duration between pulses are used to calculate the heartbeat.

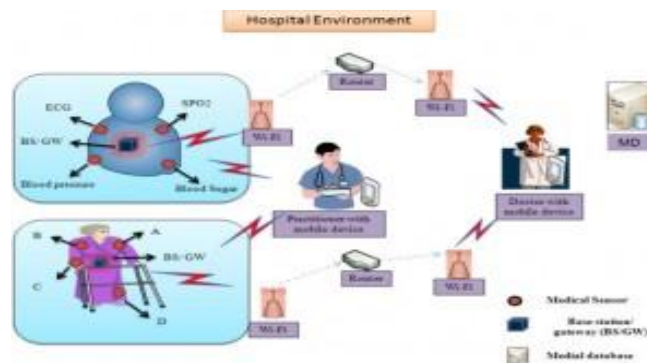


Fig 3: Wireless Health Monitoring System

## Automatic Wireless Health Monitoring System Circuit and It's Working

The main goal of this project to design a wireless system project, namely an automatic wireless health monitoring system. The main goal of this project is to monitor the temperature of the patient's body and display the same to the doctor using RF technology. In hospitals, the temperature of a patient's body needs to be monitored constantly, which is generally made by the staff members of the hospital. They notice the temperature of the patient's body constantly and keeps a record of it.

## VII. CONCLUSIONS

There is innumerable usefulness of IoT applications into all the domains including medical, manufacturing, industrial, transportation, education, governance, mining, habitat etc. Though IoT has abundant benefits, there are some flaws in the IoT governance and implementation level. The key observations in the literature are that There is no standard definition in worldwide Universal standardizations are required in architectural level Technologies are varying from vendor-vendor, so needs to be interoperable For better global governance, we need to build standard protocols. All the

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system in existing mechanism implements either energy efficiency or providing quality of information. System which provides quality of information needs more energy for good performance.

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