



# Wireless Health Monitoring System Using ZigBee & LabVIEW

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**Abstract :** The current traits in off-the-shelf wireless embedded computing boards and the growing need for green health tracking structures, fueled through the growing wide variety of sufferers, has precipitated R&D experts to discover higher health tracking structures which are each mobile and cheap. This work investigates the feasibility of the usage of the ZigBee embedded generation in health-associated tracking applications. Decided on vital signs of patients are acquired the use of sensor nodes and readings are transmitted wirelessly the use of gadgets that make use of the ZigBee communications protocols. A prototype gadget has been developed and tested with encouraging consequences.[5]

**Index Terms - Heart Beat Sensor; Temperature Sensor; Processor; LabVIEW, ZigBee**

## I. INTRODUCTION

In a growing US like India, lack of proper clinical centers has been a main issue, especially in far flung villages. Loss of right clinical remedy & prognosis in rural areas, is especially due to the poor physician to patient ratio. A good way to growth the patient care efficacy, there arises a want to enhance the patient tracking machine in a greater powerful way. The principle drawback in the modern patient tracking machine is the requirement of the bodily presence of the health practitioner in the place of the patient, which isn't possible always. Hence it becomes necessary to develop a system which does not demand the health practitioner's [1]

The Presence for patient tracking. Owing to the advancements in bioinstrumentation and telecommunications technology, it has come to be possible to layout a tracking machine to accumulate, document, show and transmit the physiological indicators from the human frame to any vicinity. The proposed patient tracking gadget allows doctors to display critical bio signals which include ECG, respiration, coronary heart price and frame temperature of sufferers mainly in ICU and CCU.[2]

The medical output of the bio signals are then posted to the internet, which can be accessed by way of the Physician from everywhere. The physician also can offer his guidelines and prescriptions if required. In other words, this tracking system measures physiological parameters like ECG, PCG, Temperature and heart charge, pre-procedures them and shows them in a graphical person interface which is posted on a customized internet site that can be considered by way of the health practitioner from anywhere[3].

## II. EXISTING TECHNOLOGY REVIEW

Maximum widely used affected person tracking structures include basically of stressed gadgets. The use of wired gadgets restricts the affected person to a room, stressed out to a mattress and also requires a physician's presence for tracking. The proposed device eliminates that dilemma and enables the health practitioner in monitoring the patients from anywhere.[4]

Even though many Wi-Fi monitoring structures had been proposed, they be afflicted by numerous negative aspects, depending upon the era used for wireless communication. Bluetooth, ZigBee, and Dash7 are some of the Wi-Fi wireless technology that are being widely preferred for Wi-Fi conversation. However, every technology has its personal difficulty, which makes the gadget

insufficient. Bluetooth has the lowest sign range of 10m and has a surprisingly slower facts transfer fee. ZigBee has a fantastically better sign range of 10 – 20m but better than Bluetooth setup value and makes it appropriate for this application.

Within the proposed system, an in-built feature of LabVIEW called the net Publishing device is used, which overcomes the above referred to limitations[4].

This project offers with the Wi-Fi conversation gadgets and structures that have a widespread effect on the healthcare enterprise nowadays. In the conventional approach the healthcare experts play the main function. They want to visit the sufferers for important prognosis and advising. There are two fundamental issues associated with this technique. [2]

**III PROPOSED SYSTEM**

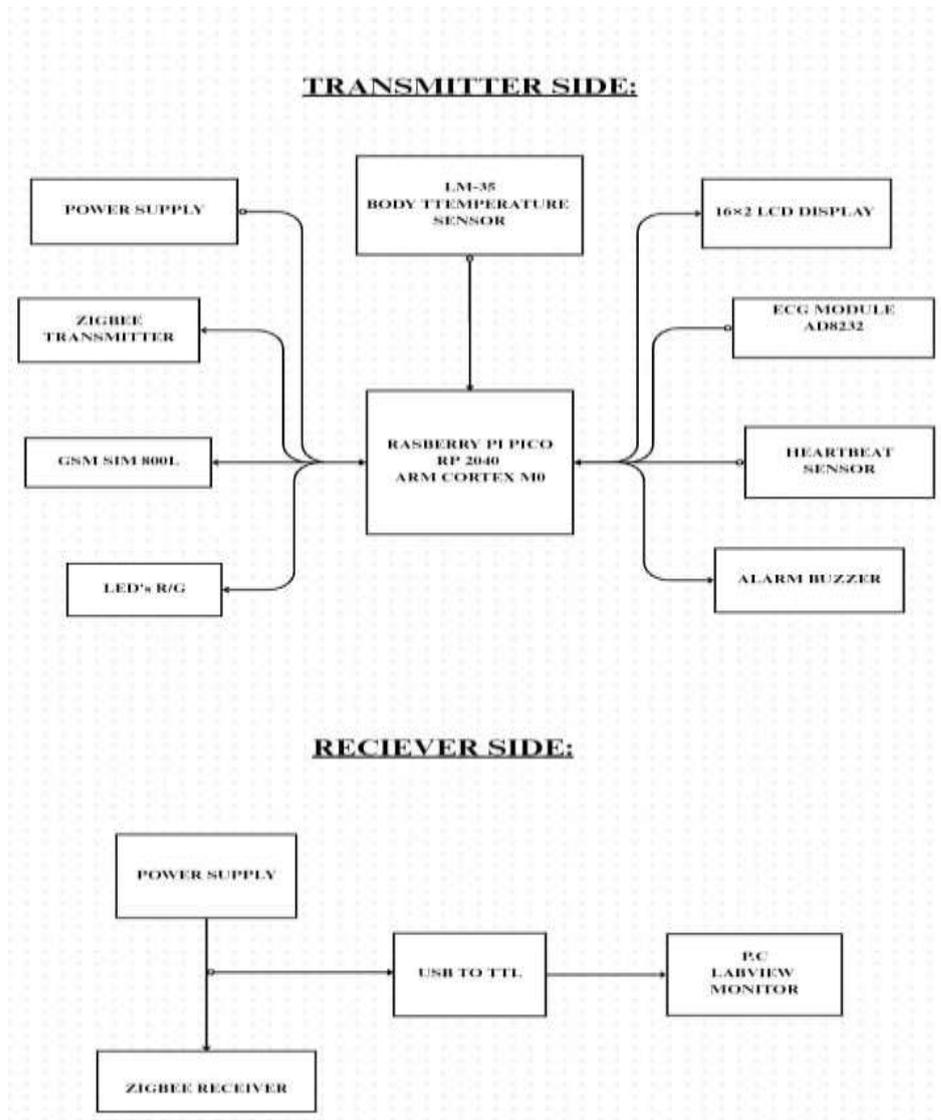


Fig 1: Block Diagram

**A) HARDWARE REQUIRED :**

- 1) **RASBERRY Pi PICO RP 2040 WITH ARM CORTEX M0 :**



Fig 2 :Raspberry Pi Pico RP 2040 with ARM cortex M0



LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. It offers output voltage in Centigrade (Celsius). It does not require any external calibration circuitry. The sensitivity of LM35 is 10 mV/degree Celsius.

As temperature will increase, output voltage additionally increases. E.g. 250 mV method 25°C. It is a 3-terminal sensor used to degree surrounding temperature ranging from -50 °C to 150 °C.[3]

#### 5) Zigbee Module :



Fig 6 : Zigbee Module

A Zigbee module is a compact hardware component that enables wireless communication based on the Zigbee protocol primarily for low-power short-range data transfer. These modules integrate a microcontroller radio transceiver and necessary networking protocols allowing devices to connect and exchange information within a Zigbee network operating on standards like IEEE 802.15.4. Zigbee facilitates the creation of mesh networks, enhancing reliability and range through interconnected nodes. These modules are designed for low energy consumption, making them ideal for battery-powered devices in applications such as smart homes, industrial automation, and sensor networks. They often feature data rates up to 250 kbps and incorporate security features like 128-bit encryption. Zigbee modules typically interface with host devices via UART, SPI, or I2C, offering a straightforward way to add wireless connectivity to various electronic systems.[3]

#### 6) GSM Module :



Fig 7 : GSM Module

The SIM800L is a small energy-efficient module that provides quad-band GSM/GPRS connectivity, allowing devices to connect to cellular networks. It operates on the 850, 900, 1800, and 1900 MHz bands and supports voice calls, SMS, and GPRS data communication. This versatility makes it suitable for applications like IoT remote monitoring and mobile communication.[3]

## B. Software Platform Implementation

### 1) LabVIEW



**Fig 8 : LabVIEW**

LabVIEW – Laboratory virtual built integrating integrated building Workbench, is an integrated interactive program integrated environment integrated built-in which applications may be created built-in a graphical notation. The program integrated language used integrated LabVIEW is a dataflow program integrated language built-in the execution is built-nonintegrated by usbuiltintegrated the structure of a graphical block diagram. The programmer can built integrated specific function-nodes via draw integrated wires. These wires propagate facts as variables and a node can execute when all its built-in is to be had. This graphical is exceedbuiltintegrated high quality as it allows the nonprogrammers to build programs through drag integrated and built-unintegrated virtual representations of lab system integrated LabVIEW. One of the additional functions of LabVIEW is that, it built-inbuilt integrated good sized guide for integrated building numerous devices, built-instruments or even cameras. LabVIEW additionally integrated help for NI hardware systems such as CompactDAQ and Compactor, with a large range of tool-unique blocks for such hardware’s like the size and Automation explorer (MAX) and virtual built-instrument integrated software structure (VISA) toolsets.[3]

## IV. IMPLEMENTATION OF THE PROPOSED SYSTEM

The system works in 3 major tiers: facts Acquisition, wi-fi Transmission, and facts tracking/Visualization.

**1. Facts Acquisition (patient aspect):**Sensors (like heart rate sensor, temperature sensor, and so forth.) are connected to the affected person. Those sensors accumulate physiological indicators together with:body temperature ,Heartbeat rate.

The microcontroller (e.g., Arduino or %) reads the analog alerts from the sensors. The microcontroller techniques the indicators and converts them into digital information. The information is formatted right into a serial string (e.g., “Temp:98.6,HR:66”).

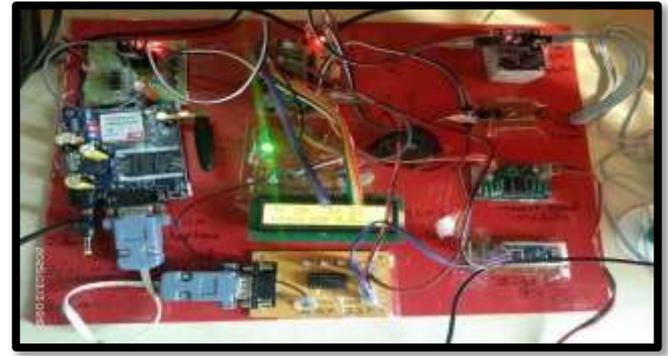
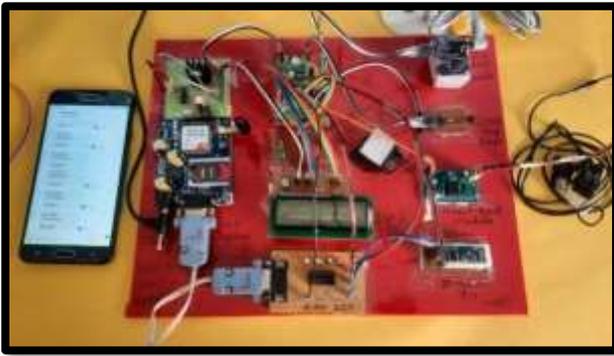
### 2. Wi-fi Transmission (Zigbee communicate)

The microcontroller sends the information via UART (serial conversation) to the ZigBee transmitter module (ZigBee).The ZigBee transmitter sends the statistics wirelessly to the Zigbee receiver located on the monitoring station.Zigbee is used for its low power, reliable brief-variety communicate, ideal for indoor use (e.g., hospital ward).

### 3. Three. Data monitoring and Visualization (LabVIEW Interface)

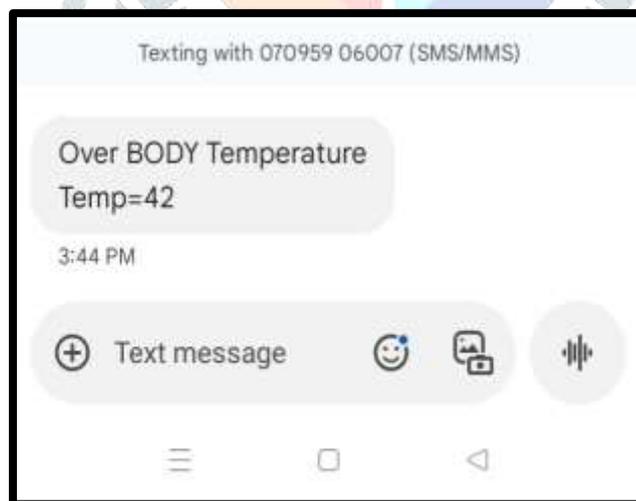
The ZigBee receiver is hooked up to a pc or computer via USB/serial port.LabVIEW jogging on the laptop reads the incoming serial statistics the use of the VISA interface.

**LabVIEW:** Parses the information to extract temperature and coronary heart beat displays it on a actual-time dashboard (the usage of graphs and signs), Generates alerts if the values exceed predefined thresholds Logs the facts for future reference or evaluation[4]



**Fig 9 : Photographs of Hardware Kit**

## V. SYSTEM RESULTS



**Fig 10 : SMS Alert**

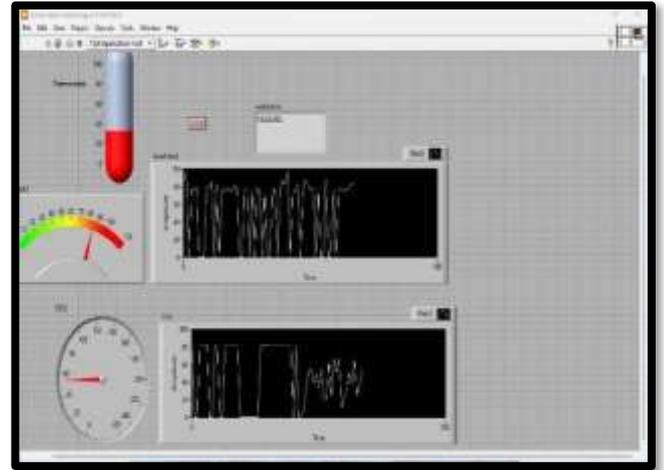
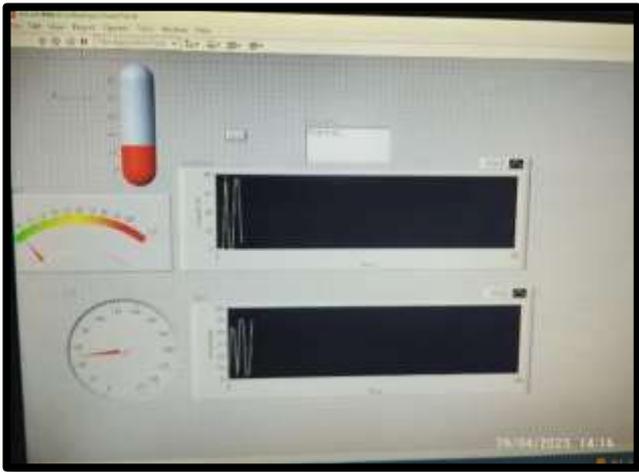


Fig 11 : Heartbeat and ECG graph by LabVIEW Software

## VI. FUTURE SCOPE

along side the tracking parameters blanketed inside the device, all the available monitoring systems also can be included. by using integrating this device with DBMS (facts Base control machine), a database may be maintained with all the patient information and medical history. by way of manipulating the output parameters, an alarm system may be implemented, so that it will alert the health practitioner in case of emergencies, thru SMS or Mail. In case of emergencies inclusive of Cardiac Arrest, certain instruments like the Defibrillator may be brought on.[4]

## VII. CONCLUSION

The Proposed gadget, when employed in everyday lifestyles, will be a revolution inside the medical field and could have a tremendous effect in rural areas where the medical doctor to affected person ratio is very low. The proposed device may also have a low cost of implementation and for this reason can be employed everywhere.[2]

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