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Multi Hop- Wireless Body Area Network (WBAN) Production for Health Supervise System

Kotthapeta. Premalatha¹, Chandan Roy², M.Shiva Kumar³, Dr.M.Sreedhar Reddy⁴

M. Tech. Student, Department of Electronics and Communication and Engineering, MRCE, Hyderabad, India¹

Asst. Professor, Department of Electronics and Communication and Engineering, MRCE, Hyderabad, India²

Asst. Professor, HOD, Department of Electronics and Communication and Engineering, MRCE, Hyderabad, India³

Principal, Department of Electronics and Communication and Engineering, MRCE, Hyderabad, India⁴

ABSTRACT: Health technologies from the Internet of Things (IoT) are expected to be one of the most remarkable options for the fast-growing aging population. IoT consists of transmissions and controls for fulfillment. Wireless Body Area Network (WBAN) is an incredibly appropriate networking method for medical IoT devices in different forms of networks. WBAN and the sensor network were studied in several respects, focusing mostly on energy quality. However, we address in this paper more practical problems for WBAN implementation. Therefore, we are proposing a WBAN building framework with 4 operations, the clustered topological structure, and support for mobility and improving transfer performance. To further minimize the overall amount of control messages, the proposed scheme delivers an energy-efficient function. Extensive simulation demonstrates a remarkable increase in WBAN efficiency across the suggested method

KEYWORDS: Patient Monitoring, IOT, Heartbeat, ECG, Temperature, etc

I. INTRODUCTION

Modern society is highly worried about how an increasingly increasing age demographic will be provided for. Therefore, one of the most important remedies for the issue is supposed to be an Internet of Things (IoT) implementation for healthcare facilities. In IoT devices capture and exchange data between themselves and the cloud such that a new data stream can be captured and analyzed. In this respect, IoT healthcare networks validate the patient's health with wearable or embedded sensing instruments in real-time. The networks then pass data obtained to health centers such as hospitals.

WBAN, a Brandnew Network, is established to carry out IoT healthcare. For medical uses, WBAN is an acceptable framework. The transmitting range is within 3 meters (one-person range), enabling WBAN to be directly mounted.

IEEE 802.15.6 specification is the product of standardization for WBAN. In-body and off-body monitoring are standardized by IEEE for a kind of sensor network. The focus is mostly put on the device's overall energy efficiency, As WBAN would typically accept the random topology and geographical status of unchargeable batteries. However, most popular WBAN architectures use a 1-star topology based on the short network specifications of a single user. There are several pitfalls for 1-hop star topology, such as the inability to monitor power, weakness of interference To obtain Multi-Hop advantages, we suggest many functions in the creation of multi-hop WBAN systems. The WBAN will first allow the network's flexibility to cover human movement and respond simultaneously if the node fails. Secondly, the load balance of relay nodes must be ensured. Finally, to fulfill a multitude of applications, it will maintain energy conservation and high quality.

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However, also WBANs are multifarious in terms of device operations that compensate for energy inability to manage and interconnection issues in the multi-hop network. This paper, therefore, discusses building challenges to implement multi-hop WBAN for IoT healthcare systems.



II. PROPOSED SCHEME

For data transmission between parents and children inside any cluster, we follow a multi-channel TDMA method. Thus, each cluster should have a separate channel band allocated. There are 10 un overlapped MICS channel bands in IEEE 802.15.6 specification (Medical Implant Communication Service). Notice that for the contact between a GW and a Tier '1' node, a standard channel is used.

When WBAN devices trigger, they start building a routing table in the environment. A Gateway (GW) initially supplies the routing table input and sets 1-hop customer-set distance parameters. The RSSI threshold number of the device consumer is calculated for the 1-hop distance parameter. When the message power dB value is higher than the RSSI threshold predefined, the node will be labeled with the next 1-hop node.

GW transmits the routing entry to its neighbors with its distance parameter. The next nodes refresh their routing table and retransmit it sequentially when they obtain them. The Tier '1' nodes are labeled when obtained by the routing table. And they will retransmit their routing table after upgrading, as described above. When the remaining nodes receiving the routing table of a level '1' node, they are the nodes of a level '2.' When two or more routing tables are obtained from many levels '1' nodes, you select the best signals for a stable connection.

This determines the topology of the hierarchical tree. And after mating with rank '2' the Tier '1' Node creates its cluster. Tier 1 nodes are turned into parent nodes and Tier '2' node becomes a cluster kid node. And then, the Tier '1' node asks GW for its cluster numbering. GW sets the amount of the channel band for the requested cluster.

This network environment has many advantages. Second, the gap from source to endpoint cannot be resolved. Second, by using a virtual cluster and reducing its distribution radius, it can decrease the potential disturbance not only via the internal WBAN node but also by the external WBAN network. The transmitting efficiency would also be increased.

In promoting mobility, we consider two factors: one is a natural human operation, and the other is a network malfunction recovery.

We create a control message for this reason. After the start-up process, Tier '1' nodes are transmitted with the common channel band in each of the superframes. The control message contains the following information on the number of child nodes, the remaining battery, and the frequency spectrum.

- Number of child nodes: if a level "2" node is detected utilizing an auditory control message, a level "2" node is sent to a state "1" node that includes two fewer child nodes to ensure load balancing than its level "2" tier parent.
- Battery residual information: if a battery exists in the child's parent node, the child is transferred to a different level '1' neighbor node.
- Battery information:
- Operating frequency band details: if a children's node needs to move to another cluster, it is expected to adjust the information embedded in the message to the target cluster channel.

As this control message is listened to by a child node, the RSSI value of your parent's message is verified. If for a certain time or some exchange control message numbers the RSSI value is consistently smaller than the predefined maximum, it attempts to locate other control messages that are higher than the RSSI value of the parent-child node may ask the child node to move it to another cluster if the message is louder enough to allow a child node understand. So, while your legacy parent is further gone, your child node needs to shift its cluster. This mechanism gives the support of versatility and the resilience of network loss

III. LITERATURE SURVEY

A new health care architecture focused on Safe IoT was clarified by ProsantoGope et al.[1] in BSN-Care using the body's sensor network to build a network of body sensor systems for enhancing IoT medical services. A community of modest nodes with lightweight wireless sensors can display a patient in this situation.

In the "Untraceable Sensor Movement in Distributed IoT Infrastructure," TzonelihHwang et al. [2] have been inspected for IoT interface engineering and unreported authentication in three steps: registration process, movement, and motion among clusters. The IoT movement is proposed. It recommends the structure. Extra protection is checked for the lower overhead for the device.

The WBAN development initiative, which comprised 4 activities, clustered topology, scalable assistance, and enhanced transmission skills, was suggested by Tae-Yoon Kim et al. [3]. The WBAN development conspires. The proposed plot provides an assistant gain by growing the sum of aggregate control messages to achieve an efficient vitality element.



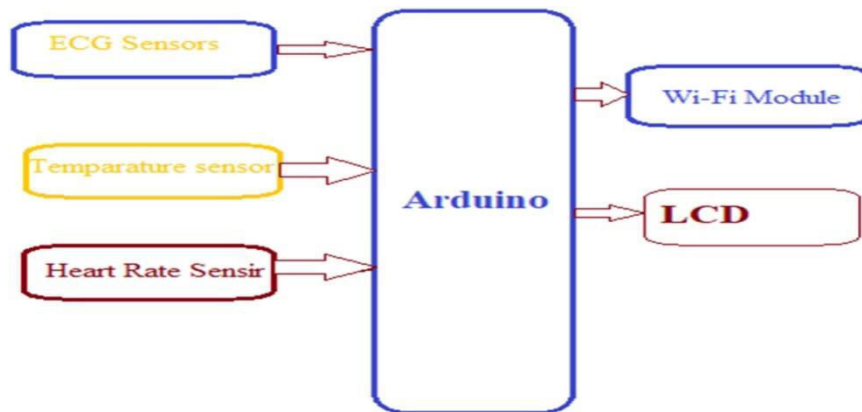
Charalampos Doukas et al.[4] introduced a cloud-based network for compact and wearable public resources sensors, which showed an inescapable social insurance-related IoT vision of the planet.

In the paper "A medical health care system based on IoT," Tianhe Gong et al. [5] analyzed issues in the existing intelligent health care system. For protection verification, lightweight private homomorphism formulas and an improved DES encryption measurement.

Lin Yang et al. have submitted a paper entitled "Wheelchair users' Home Mobile Healthcare System" to explain Wireless Body Sensor Networks platform engineering and scheme strategy. To recognize the unsafe status of wheelchair participants, the framework tracks the state of the roller and living environments

IV. MAJOR BUILDING BLOCKS

Block Diagram

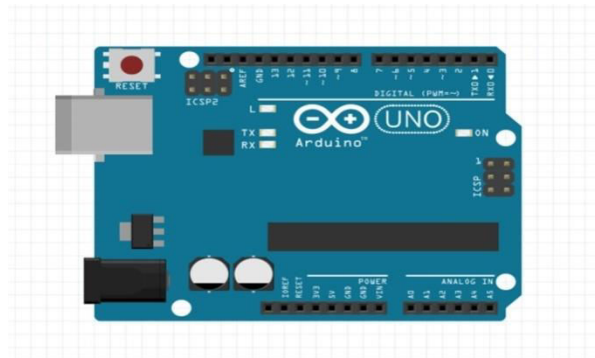


Fig;1.Microcontroller

A microcontroller is a device integrated into a single chip in a set of the components of a microcontroller system. This ensures that a microcontroller integrates on the same microchip CPur center of memory (ROM as well as RAM). A timer module for a certain amount of time to enable the microcontroller for tasks.

The serial I/O port enables microcontroller data flow and other devices such as a PC. An ADC supplies analog input data for the microcontroller processing.

ATmega 328 based module The Arduino Uno is a microcontroller (datasheet). It features 14 optical pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB socket, a control jack, an ICSP header, and a reset button. This function has 14 PWM outputs. The electronic power jack is also issued. It includes anything appropriate to assist the microcontroller; it is only attached or driven to a USB cable system using an AC-to-DC adapter or battery.



Fig;2.Arduino UNO



The Uno doesn't operate on previously built boards in the FTDI USB serial driver chip. This microcontroller has a USB-to-serial adapter (Atmega8U2 up to the r2 version). This lifts the HOB to the floor and also activates DFU mode. The motion contains the following changes:

Set the SDA/SCL pins next to the AREF plate, and then set IOREF to adjust the shield to the voltage and two pins next to the RESET pin.

The Council sent. In the future, the shields would comply with both the Arduino Owing 5V AVR board and 3.3V. The above is a non-related pin for future applications.

Stronger circuit RESET.

Replace the 8U2 atmega 16U2.

"Uno" in Italian means one and is called to label Arduino 1.0's next update. The reference models of Arduino would be the Uno and version 1.0. For a link with previous models, see the Arduino board index. Uno is the most current USB-Arduino board sequence of the reference model for the Arduino interface.

Wi-Fi Module/Node MCU

NodeMcu: NodeMCU is an open-source IOT framework that is collaborative, programmable, and cost-effective in contrast to other MCUs. The ESP8266 Wi-Fi socket is fast, smart, and Wi-Fi-enabled and has firmware going. The firmware uses the vocabulary of Lua scripting. For the prototyped development package, Wi-Fi present in the ESP826 MCU is incorporated and simple.

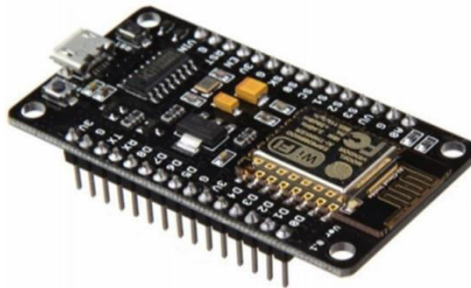


Fig.3; Node MCU

ECG Sensors

This is the collection of getting electrical activity calculations being acquired on an ECG board with Arduino. This electrical reaction may also be plotted as an electrocardiogram or an EKG.

Due to noisy signals emitted from the op-amp, the AD8232 generates weak PR and QT signals. The AD8232 is a 4-channel optimized signal conditioning block for ECG and other bio-potential applications.



Fig.4; Sensor package for Arduino AD8232 Heart ECG

In noisy situations involving movement or remote position of an electrode, the ECG AD8232 Heart ECG Sensor Control Module for Arduino is programmed to detect, amplify and process small bio-potential signals.

The AD8232 Heart Rate Sensor can break nine IC connections which can be soldered with a stick, wires, or other attachments. SDN, LO+, LO-, Performance, 3.3V, GND have vital pins in the operation of this monitor utilizing Arduino or another production screen.

TEMPERATURE SENSOR

NTC Sensor Thermistor module is cost-efficient, compact module size. The weather is rather sensitive. It is used in general to detect air temperature. The temperature detection threshold may be adjusted by changing the potentiometer.

By sensing temperature differences in the environment, DO output can be linked directly to the microcontroller to detect high and low. The Module has between 20 and 80 degrees Celsius temperature detection range. A line-temperature sensor for water tempering power, the water tank, and so on will substitute this module.

The 4-wire approach for the calculation of thermistor is usually the most reliable since no current flows in any cable measuring wire and therefore no extra resistance from the cable wire is possible.



Fig.5; Temperature Sensor

Features:

1. Adopt the sensor of the NTC thermistor.
2. The output comparator, clean signal, good waveform, powerful driving ability is over 15 m2.
3. The threshold of detection is adjusted with a potentiometer.
4. Voltage: 3.3 V to 5 V. Operating Voltage:
5. Type of output: wireless output transfer (0 and 1).
6. It has a set boulder hole that is comfortable to mount.
7. Use LM393 compartment with big voltage.

Module instructions:

1. An environmentally sensitive thermistor modulus is widely used for the detection of atmospheric temperature.
2. By adjusting the potentiometer the temperature sensor (i.e. control) can be adjudicated, such as the need to control the temperature of the environment is 50 degrees, whereas the module, corresponding to the ambient temperature, does not change to the green light, the high level of the DO output below the preset temperature, the high output, the green light.
3. The DO output can be directly linked to the single-chip microcomputer utilizing a single chip microcomputer to detect the low and high stage, thus detecting the difference in ambient temperature.



4. Our relay module, which can shape an operating temperatures controller and managed instruments, also can link the ventilator used for the cooling, etc., can directly drive the DO production.
5. The 20-80 degree Celsius temperature detection module.
6. A temperature sensor line may also be used to monitor water levels, the water tank control, etc.

Heart Rate Sensor



Fig.6;Heart Rate

1. In several electronic modeling and microcontroller programs, heart rate data can be used. But it's difficult to read cardiac data, but the pulsed sensor amplification lets us read cardiac pace. An Arduino heart rate Plug-and-Play sensor is the Amped Heart Rhythm Pulse Control.
2. Teachers, singers, athletes, and smartphone players will use it to easily use live cardiac data in their programs.
3. Note: Color can differ for cable links.
4. It provides a simple optical heart friction sensor with amplifying and noise cancellation circuits to ensure reliable pulse measurements quickly and easily.
5. Pulse Sensor Amped increases and cancels noise on the hardware. Reliable pulse measurements are significantly quicker and simpler to receive. Amped Pulse Sensor functions on an Arduino 3V or 5V.

Characteristics:

- A color-coded cable, with the male header connectors standard. Plug it directly into a breadboard or Arduino. There is no need for soldering.
- The Pulse Sensor has three holes at the outer side, making it almost easy to stitch.
- Software for the visualization (made in processing) to see the sensor performance and troubleshooting immediately.

LCD



Fig.7;LCD Display



You would need a monitor if you would like to provide visual performance to your Arduino ventures. The LCD1602 Parallel LCD Monitor with IIC/I2C interface is a very effective solution if you only need to display little. This is the Parallel LCD monitor for the 16/2 White extension to the RGB liquid crystal display, offering a quick and cost-effective solution. This show is a 16 characters display with a 2-line display with plain white text with high contrast, with a blue backlight.

It's a big blue LCD monitor backlight. For Arduino-based testing, it is awesome. It is really easy to connect with Arduino or other microcontrollers to this LCD1602 parallel LCD monitor with Yellow Backlight.

This monitor overcomes the LCD1602 parallel LCD in which roughly 8 pins are wasted on your Arduino to be used. Fortunately, an I2C adaptor is soldered directly to the monitor pins in this product. Therefore you can only attach the I2C pins that represent a nice library and a little code. The I2C is a serial bus type designed by Philips utilizing two bilateral lines known as SDA (Serial Data Line) and SCL (Serial Clock Line). Both must be linked through resistors pulled up. The working voltages are 5V and 3.3V. The wiring is very simple if you have already soldered an I2C adaptor on the board as in this product. Typically you can only be fitted with four pins. Naturally, VCC and GND. It operates with 5 volts on the LCD. We're therefore aiming for the 5V pin. The shown values may be either plain text or numerical values read on the sensors, for example, the temperature or pressure, or even the amount of cycles conducted by the Arduino.

If you have an I2C adaptor and want to order just the display, then please click [here](#)

Characteristics:

- The GUI of Arduino IIC/I2C was built to minimize Arduino board IO port use
- The I2C Adapter offers connection versatility
- I2C Total cables are limited.
- 16 lines wide, 2 lines
- Blue backdrop white text
- With a resistor or PWM, a single LED backlight can be conveniently dimmed with it.

ARCHITECTURE

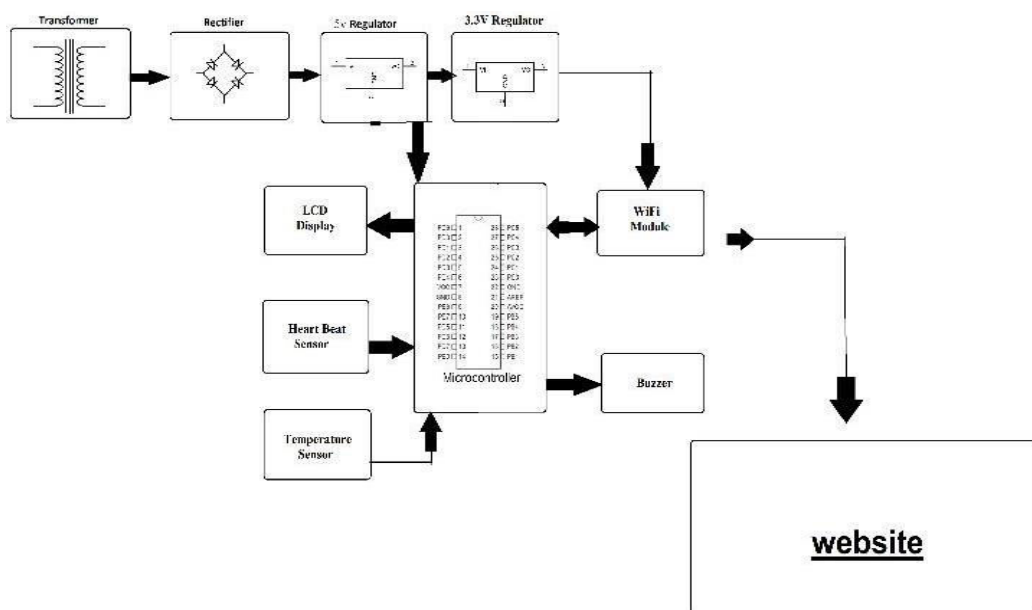


Fig.8;Architecture

FLOW CHART

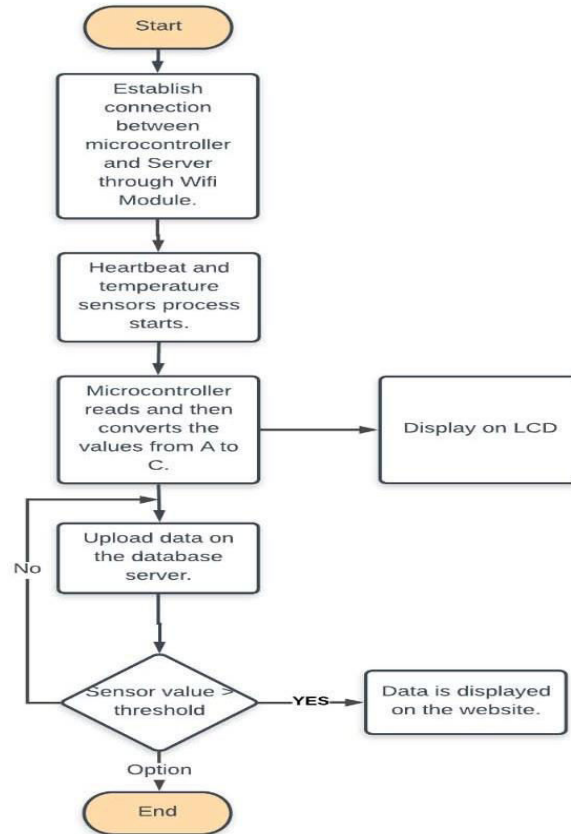


Fig.9;Flow Chart

V. RESULT

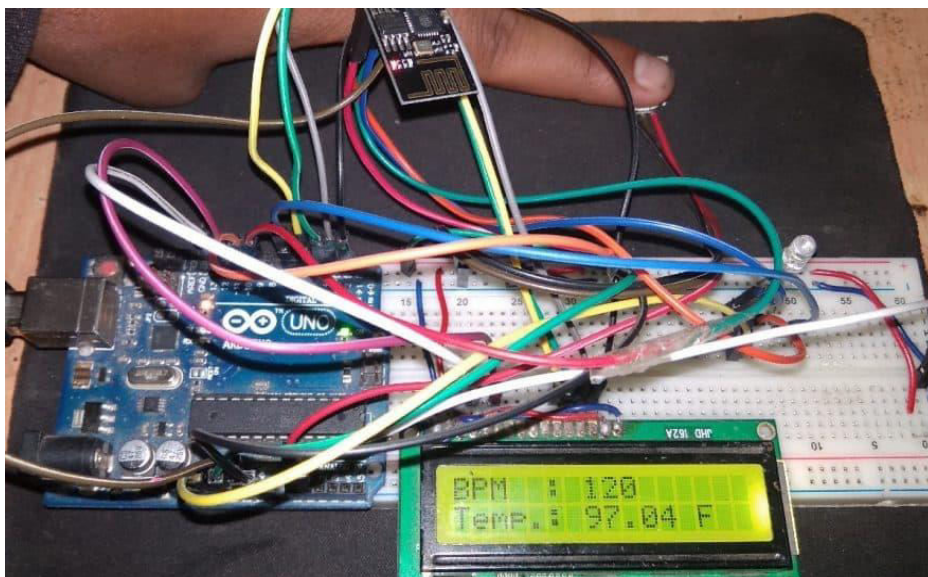


Fig.10;HARDWARE CIRCUIT



VI. ADVANTAGES

- Used for persistent disease detection
- Used for protection purposes in military
- Contributes to human and computer connectivity

VII. APPLICATIONS

- Treatment with medical wellbeing
- Monitoring in sports and wellness
- Audio Wireless
- Camera applications for personal usage
- The Army
- Security
- Entertainment and gaming

VIII. CONCLUSION

This paper proposes a safe health care system utilizing the body sensor network to fix current health monitoring problems. This program follows the criteria for capturing, collecting, and showing real-time essential species to a professional involved this can be calculated very easily and every test can be replicated several times. Since the information from a particular case is obtained in a given interval, it is possible to enhance the past and to suggest a patient. With more sensors attached to more consumers, this initiative can be expanded and each patient can be increased to have special health care partner credentials GS Module can also be used to pick up a text message to check the patient status and the GPRS module for further implementation for this initiative. This appeal concerns automated patient treatment.

FUTURE SCOPE

Various routing protocols with identical criteria may also be evaluated for the future. The project may also be expanded to extend the separation between the source sensor and the simple station in multi-hop data transport to have the highest possible output and also to suit people's height.

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