

WIRELESS MACHINE TO MACHINE HEALTH CARE SOLUTION USING ANDROID MOBILE DEVICES IN GLOBAL DEVICES

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ABSTRACT

The research and design of embedded pulse monitoring instrument overcome the shortcoming of traditional pulse diagnosis system. The instrument has simple structure stable and reliable operation, high accuracy, low power consumption, good portability full featured function, and extensive application occasion. The real time monitoring system for cardiac patient physical state is based on wireless transceiver module technology. It can be taken by patient and keep the patient moment intact because it is miniature and portable .The system can monitor and record the physical states and moment parameters real time, and the provide auxiliary means for the correct diagnosis of doctor. With intelligent transceiver module, the sign of acute disease for patient can be found early, and then the patient can be help in time, the sudden death of patient can be avoid. The wireless transceiver module technology can be suite for short distance communication, and the transmission distance is limit only about 10 meters, and then it can be suitable for in- patient monitoring.

Keywords: *Wireless Transceiver, Wpan, Temperature Sensor, Data Acquisition System*

1. INTRODUCTION

This system describes a wireless M2M healthcare solution that uses Android mobile devices in a global network. The use of a global M2M network in healthcare application service coverage by providing efficient support for IPv6 over low-power wireless personal area network (WPAN) and mobile technology in wide areas.

Microcontroller Based Wireless temperature and ECG sensor suitable for operation in a small office/home environment. Many individuals and organizations may wish to use electronic surveillance ones promises to replace the use of traditional healthcare systems based on wireless sensor networks, providing ease of measurement, extension of network, accessibility, and reliability.

2. DATA ACQUISITION SYSTEM FOR PATIENT

To keep the moment of the patient intact with the sensors on his body, the wireless sensors are required to be minimized and portable. Base on wireless transceiver module communication technology the patient physical states data acquisition system is made up of sensors, signal conditioning unit, A/D converter, embedded PIC controller unit and transceiver communication module. According to the state of an illness of the patient, the sensors which are fixed on patient body may be of some of these sensors ECG sensors, blood pressure sensors. Each sensor is fasted on corresponding position of the patient's body.

The physical states and movement parameters are acquired with sensors at first and then the signal is been transferred to signal conditioning unit to be amplified and filtered, A/D converter transforms the analogue signal to digital signal the

main function of PIC controller is to integrate the data with the definition frame format, at last, the transceiver communication module sends it to remote monitoring system or display.

3. WORKING PRINCIPLE

The signals are continuously recorded in separate files on flash memory for feature analysis. Once pathological abnormality is detected, the monitoring device requests a transmission through PC or PDA to the remote care center.

For the temperature measurement, thermistors are used that measures the temperature of the patient. For respiration rate measurement, displacement method is adopted that uses displacement sensors which are placed in the thoracic region or abdomen region.

The pressure sensors measure the blood pressure of the blood. These analog input signals are fed into the signal conditioning part of the system that includes amplifiers and filter circuits. After signal conditioning, the analog signals are converted to digital signals using the microcontroller. Then the microcontroller produce output in a computer system through serial port interface, through Bluetooth interface, or using Zigbee modules such as CC2500 or standard IEEE 802.15.4 is selected as the wireless transmission standard. Methodology is important to achieve a major goal with reliability, predictability. Accordingly a new system is to be developed. So as to design such system with predictable results in a predictable time embedded system software is used to make most effective & wide variety system.. The PIC would be programmed using embedded C software developed by Kiel microvision-3. Then the PIC microcontroller transmits or receives signals through wireless modules either Bluetooth or wireless transceivers or using Zigbee modules. The real time signals would be transmitted / received by RF transceiver modules.

Real time location of the event is very important and valuable piece of information so as to make real time decisions. It is beneficial for fault tolerant, routing, aggregation, event detection, & so on.

Monitoring and control is the core of the real-time monitoring system for patient physical states, and it can dispose , display , save ,query and analyze the data from each patient.

To know the physical states of inpatient, the physical parameters need to be monitored real - time. With the increase in the number senior citizens and chronic diseases, the number of elderly patients who need constant assistance has increased. Elderly patient is the continuous monitoring of their vital signs. The results prove that the mobility, usability and performance of our proposed system have impacts on the user's attitude, and there is a significant positive relation between the user's attitude and the intent to use our proposed system.

This proposed system is expected to monitor the electrical activity of heart of the patient under critical care more conveniently and accurately for diagnosing which can be interfaced with PIC 18F4450 to bring it under a network system widely for the doctor to monitor the patient's condition sitting in his own office without being physically present near to the patients bed.

Wireless networked embedded device includes signal conditioning circuitry, sensors and a PIC controller with a wireless Transceiver module (CC2500). To measure or monitor human movements or activities, a graphical LCD display is selected for its low price, small size, capability of continuous measurement, and ease of integration.

IEEE 802.15.4 is selected as the wireless transmission standard because of its short-range, low-cost, and low power characteristics. This system can not only realize accurate measurement of indicators, but also save the patients travel between home and the hospital.

4. POWER SUPPLY- BLOCK DIAGRAM

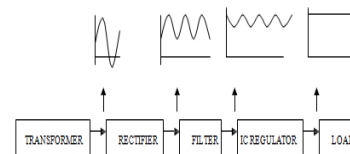


Fig 3.1 Block Diagram of Power supply

The ac voltage, typically 220Vrms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

A. PIC 18F8772A

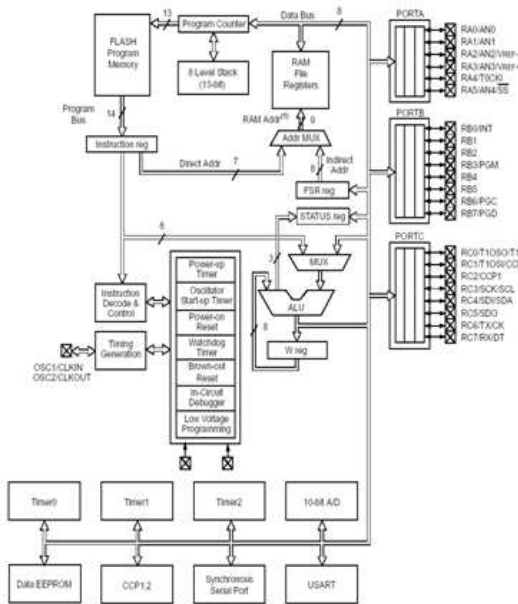


FIG 4.1 PIC ARCHITECTURE

- High performance RISC CPU
 - Only 35 single word instructions to learn
 - All single cycle instructions except for program Branches which are two cycle
 - Operating speed: DC - 20 MHz clock input, DC - 200 ns instruction cycle
 - Up to 8K x 14 words of FLASH Program Memory,
 - Up to 368 x 4 bytes of Data Memory (RAM)
 - Interrupt capability (up to 14 sources)
 - Direct, indirect and relative addressing modes
 - Power-on Reset (POR)
 - Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
 - Processor read/write access to program memory
 - Wide operating voltage range: 2.0V to 5.5V
 - Low-power consumption
- B. PIN DIAGRAM

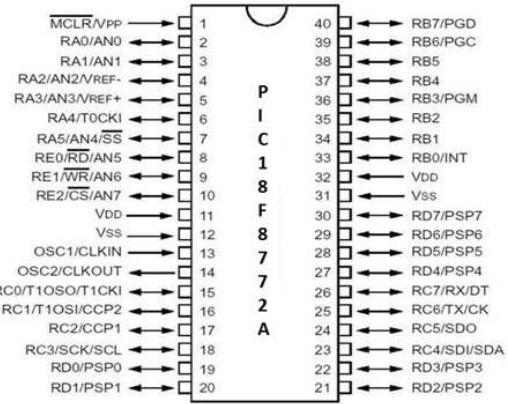


FIGURE 4.2 PIN DIAGRAM

I/O PORTS

Some pins for these I/O ports are multiplexed with an alternate function for the Peripheral features on the device. In general, when a peripheral is enabled, that pin may not be used as a general purpose I/O pin.

PORTA AND THE TRISA REGISTER

PORTA is a 6-bit wide, bi-directional port. The corresponding data direction register is TRISA. Setting a TRISA bit (= 1) will make the corresponding PORTA pin an input (i.e., put the corresponding output driver in a Hi-Impedance mode). Clearing a TRISA bit (= 0) will make the corresponding PORTA pin an output (i.e., put the contents of the output latch on the selected pin). Reading the PORTA register reads the status of the pins, whereas writing to it will write to the port latch. All write operations are read-modify-write operations.

PORTB AND THE TRISB REGISTER

PORTB is a 4-bit wide, bi-directional port. The corresponding data direction register is TRISB. Setting a TRISB bit (= 1) will make the corresponding PORTB pin an input (i.e., put the corresponding output driver in a Hi-Impedance mode). Clearing a TRISB bit (= 0) will make the corresponding PORTB pin an output (i.e., put the contents of the output latch on the selected pin). Three pins of PORTB are multiplexed with the Low Voltage Programming function: RB3/PGM, RB6/PGC and RB7/PGD. PORTB pins have a weak internal pull-up.

7. BLUETOOTH PROTOCOL

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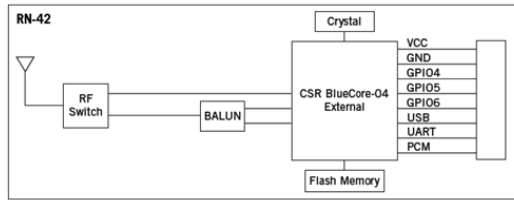


FIGURE 7.2 Block Diagram

FEATURES

- Fully qualified Bluetooth® version 2.1 module, supports version 2.1 + Enhanced Data Rate (EDR)
- Backwards-compatible with Bluetooth version 2.0, 1.2, and 1.1 Postage stamp sized form factor, 13.4 mm x 25.8 mm x 2 mm (RN-42) and 13.4 mm x 20 mm
- Low power (26 uA sleep, 3 mA connected, 30 mA transmit)
- UART (SPP or HCI) and USB (HCI only) data connection interfaces.
- Sustained SPP data rates: 240 Kbps (slave), 300Kbps (master)
- HCI data rates: 1.5 Mbps sustained, 3.0 Mbps burst in HCI mode
- Embedded Bluetooth stack profiles included (requires no host stack): GAP, SDP, RFCOMM, and L2CAP protocols, with SPP and DUN profiles support
- Bluetooth SIG certified
- Castellated SMT pads for easy and reliable PCB mounting
- Certifications: FCC, ICS, CE
- Environmentally friendly, RoHS compliant .

8. CONCLUSION

The real time monitoring system for cardiac patient physical state is based on wireless transceiver module technology. It can be taken by patient and keep the patient moment intact because it is miniature and portable .The system can monitor and record the physical states and moment parameters real time, and the provide auxiliary means for the correct diagnosis of doctor. With intelligent transceiver module , the sign of acute disease for patient can be found early, and then the patient can be helped in time, the sudden death of patient can be avoided. The wireless transceiver module technology can be suited for short distance communication, and the transmission distance is limited only about 10 meters, and then it can be suitable for in- patient monitoring.

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