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***Research Article***

# Advance Automation System of P2 (Patient Parameter) Measuring for Healthcare System

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**Abstract**

Nowadays real time patient monitoring system very complex. To check the physical parameters separate monitoring system had been used Like Stethoscope, thermometer, pressure cage, weight scales, etc., the separation system is increasing the measured time and spread the diseases. To overcome these drawbacks, this project is designed for all systems are connected to the single vehicle (smart Chair). The designed system will be collecting the patient's heart rate, temperature, pressure level, weight scale is interconnecting to the chair and the readings are noted as data base. His system is reducing the disease spreading from one patient to another patient. It can be reduced the painful time for patients and it can be easily measured. All sensors are connected to the PIC microcontroller. The micro controller is reading the patient data and print out through the computer or mobile using micro C software.

**Keywords:** Heartbeat; Weight scale; Smart chair; PIC Microcontroller; Micro C.

## Introduction

As the world's population ages, those suffering from diseases of the elderly will increase. In-home and nursing- home pervasive networks may assist residents and their caregivers by providing continuous medical monitoring, memory enhancement, control of home appliances, medical data access, and emergency communication. Researchers in computer, networking, and medical fields are working to make the broad vision of smart healthcare possible [1].

The present patient monitor systems in hospitals allow continuous monitoring of patient vital signs, which requires the sensors to be hardwired to nearby, bedside monitors or PCs, and essentially confine the patient to his hospital bed. Even after connecting these systems to a particular patient, a Para medical assistant need to continuously monitor and note down all the vital parameters of a given patient by keeping track of all of his/her records manually [2].

Here the physiological conditions of the patient's are monitored by sensors and the output of these sensors is transmitted via Zigbee [3] and the same has to be sent to the remote wireless monitor for acquiring the observed patient's physiological signal. The remote wireless sensor monitor is constructed of Zigbee and Personal Computer (PC) .The measured signal has to be sent to the PC, which can be data collection. Although Bluetooth is better than Zigbee for transmission rate, Zigbee has lower power consumption. The first procedure of the system is that the wireless sensors are used to measure Heart rate, temperature and fall monitoring from human body using Zigbee [4].

The measured signal is sent to the PC via the RS-232serial port communication interface. In particular, when measured signals cross the standard value, the personal computer will send a message to the caretaker's mobile phone [5].

## Block diagram

Here using two types of block diagram module. They are chair module (Fig. 1) and monitor module (Fig. 2).

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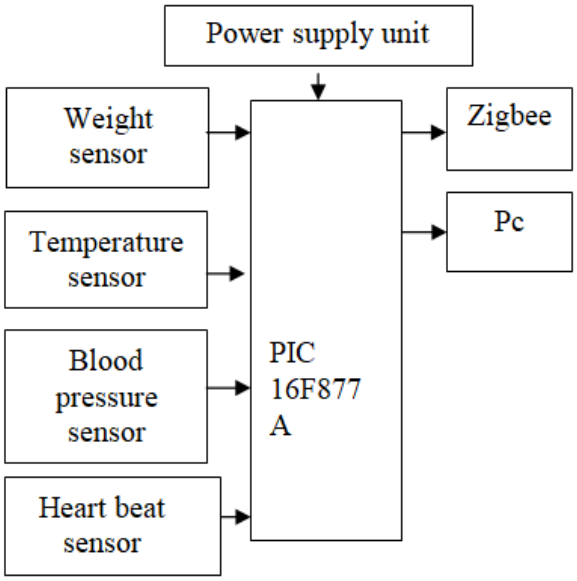


Fig. 1. Chair module

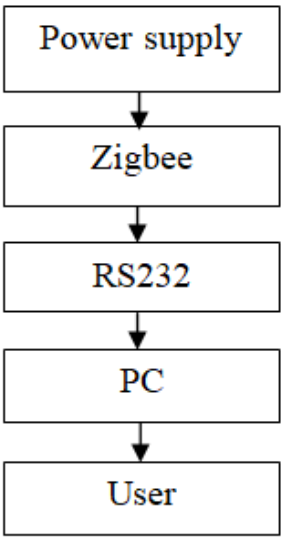


Fig. 2. Monitor module

## Hardware implementation

### *Microcontroller*

A computer-on-a-chip is a variation of a microprocessor which combines the processor core (CPU), some memory, and input/output (I/O) lines, all on one chip. Microcontroller can be viewed as a set of digital logic circuits integrated on a single silicon chip. This chip is used for only specific applications [6].

In the present project, PIC 16f877A microcontroller is used. For most applications, we will be able to find a device within the family that meets our specifications with a minimum of external devices, or an external but which will make attaching external devices easier, both in terms of wiring and programming. For many microcontrollers, programmers can built very cheaply, or even built in to the final application circuit eliminating the need for a separate circuit. Also simplifying this requirement is the availability of micro-controllers wit SRAM and EEPROM for control store.

### *Power supply unit*

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronics' circuits and other devices. A power supply can by broken down into a series of blocks (Fig. 3), each of which performs a particular function. For example a 5V regulated supply [7].

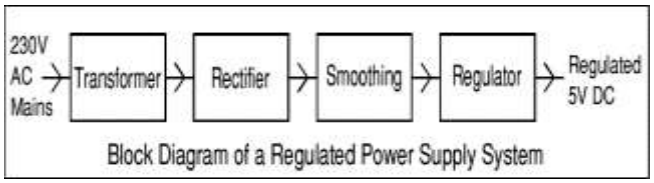


Fig. 3. Block diagram of power supply unit

## Serial communication

### *DTE and DCE*

The terms DTE and DCE are very common in the data communications market. DTE is short for Data Terminal Equipment and DCE stands for Data Communications Equipment. As the full DTE name indicates this is a piece of device that ends a communication line, whereas the DCE provides a path for communication. For example, the PC is a Data Terminal (DTE). The two modems (yours and that one of your provider) are DCEs, they make the communication between you and your provider possible.

### *RS-232*

In telecommunications, RS-232 is a standard for serial binary data signals connecting between a DTE (Data terminal equipment) and DCE (Data Circuit-terminating Equipment). In RS-232, data is sent as a time-series of bits. In addition to the data circuits, the standard defines a number of control circuits used to manage the connection between the DTE and DCE. The interface can operate in a full duplex manner, supporting concurrent data flow in both directions. The standard does not define character framing within the data stream, or character encoding.

**Interfacing devices**

***Heart beat sensor***

Heart beat sensor is designed to give digital output of heat 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. The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. The sensor consists of a super bright red LED and light detector (Fig. 4). The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat.


Fig. 4. Heart beat sensor

***Digital thermometer***

The DS1620 is a complete digital thermometer on a chip, capable of replacing the normal combination of temperature sensor and analog-to-digital converter in most applications. It can measure temperature in units of 0.5° Centigrade (C) from -55° C to +125° C. (In Fahrenheit (°F), units of 0.9° F and a range of -67° F to +257° F.) The DS1620 can also operate as a standalone thermostat (Fig. 5). A temporary connection to a controller establishes the mode of operation and high/low-temperature set points. Thereafter, the chip independently controls three outputs: T (high), which goes active at temperatures above the high-temperature set point; T (low), active at temperatures below the set point; and T (com), which goes active at temperatures above the high set point, and stays active until the temperature drops below the low set point.


Fig. 5. Digital thermometer

***Zigbee***

Zigbee is an IEEE 802.1 5.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low power digital radios, such as for home automation, medical dev ice data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Hence, Zigbee is a low-power, low data rate, and close proximity (i.e., personal area) wireless ad hoc network. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs) [8], such as Bluetooth or more general wireless networking such as Wi-Fi. Applications include wireless light switches, home energy monitors, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer [9]. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee dev ices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Zigbee is typically used in low data rate applications that require long battery life and secure networking (Zigbee networks are secured by 1 28 bit symmetric encryption key s.) Zigbee has a defined rate of 250 kbit/s, best suited for

 

intermittent data transmissions from a sensor or input device (Fig. 6).


Fig. 6. Zigbee

***Blood pressure sensor***

The blood pressure sensor (Fig. 7) is a non-invasive sensor designed to measure human blood pressure. It measures systolic, diastolic and mean arterial pressure utilizing the oscillometric technique. Pulse rate is also reported.

Fig. 7. Blood pressure sensor

***Weight sensor***

Flintec offers a market-leading range of high quality, precision weight sensors for use across multiple applications and systems.Our range of products incorporates sensors and weight measuring devices, designed to be a complete weighing system. Flintec's electronic measuring devices are well known for their accuracy and reliability.

Fig. 8. Weight sensor

**Software implementation**

***Software tools***

- Development tool – MPLAB IDE v7.42
- language –Micro C for PIC pro
- parameter output-cool term

**Result and discussion**

Our project is a working model which incorporates sensors to measure parameters like body temperature, heart beat rate, weight scale and blood pressure [10]. All the parameters are connected to the chair and each of the sensors are interfaced with the microcontroller shown in fig. 9.By power supply unit all the sensors are activated and the patients parameter readings are taken by sensors, it can be transmitted from the zigbee transmitter to zigbee receiver [11].HI-TECH Software makes industrial-strength software development tools and C compilers that help software developers write compact, efficient embedded processor code.

HI-TECH PICC is a high-performance C compiler for the Microchip PIC micro 10/12/14/16/17 series of microcontrollers. HI-TECH PIC C is an industrial-strength ANSI C compiler - not a subset implementation like some other PIC compilers. The PICC compiler implements full ISO/ANSI C, with the exception of recursion. All data types are supported including 24 and 32 bit IEEE standard floating point. HI-TECH PICC makes full use of specific PIC features and using an intelligent optimizer, can generate high-quality code easily rivaling hand-written assembler. Automatic handling of page and bank selection frees the programmer from the trivial details of assembler code.

Fig. 9. Interfacing device

Choose MPLAB C18, the highly optimized compiler for the PIC18 series microcontrollers, or try the newest Microchip's language tools compiler, MPLAB C30, targeted at the high performance PIC24 and DSP IC digital signal controllers. Or, use one of the

 

many products from third party language tools vendors. They integrate into MPLAB IDE to function transparently from the MPLAB project manager, editor and compiler.

After configuring the initial settings the code can be written in the Code Editor of micro C. The patient parameter reading is shown in COOL TERM software shown in fig. 10.

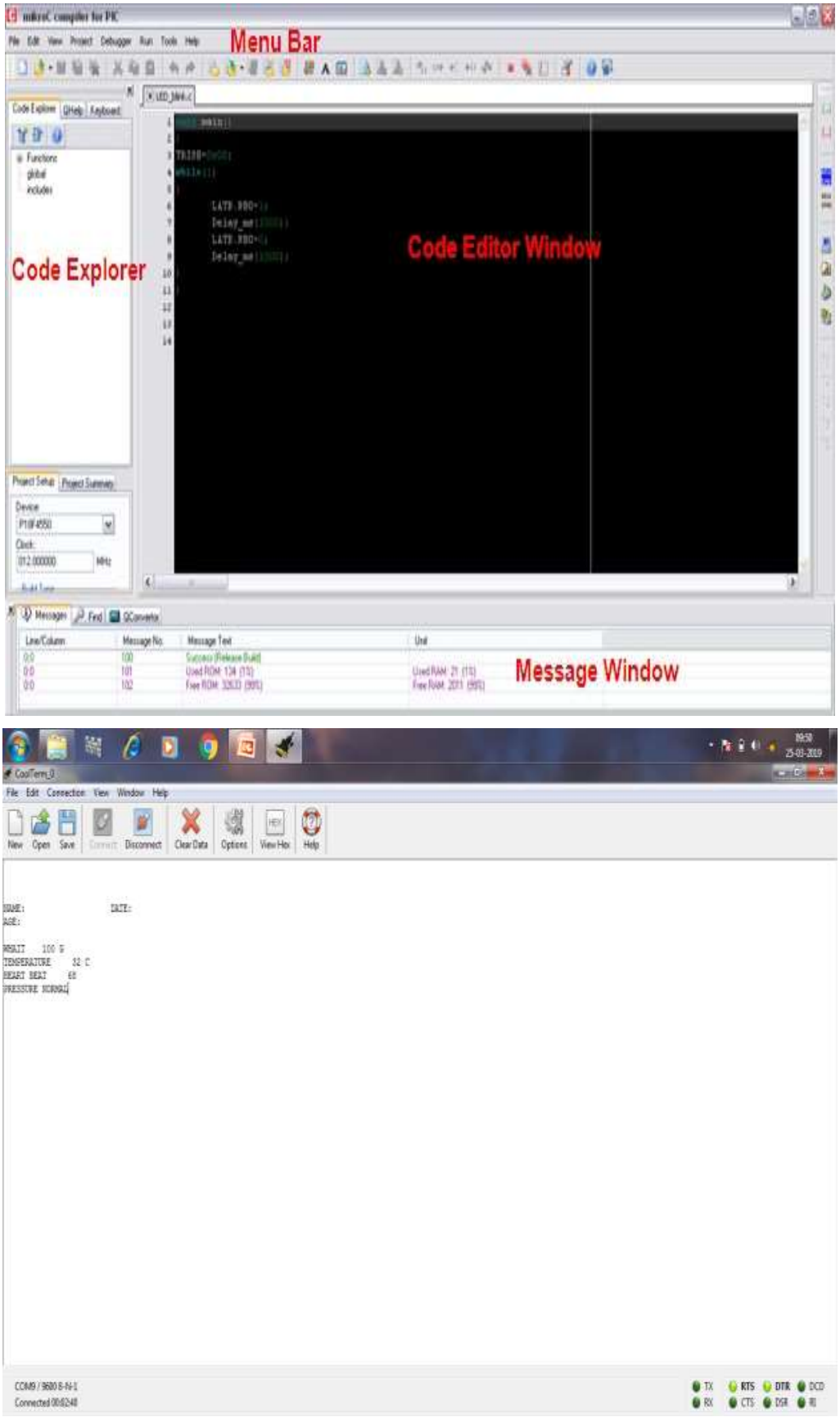


Fig. 10. Windows with micro C IDE

 

## Conclusions

The present working model which incorporates sensors to measure parameters like body temperature, heart beat rate, weight scale and blood pressure. Here this system is used for reducing the disease spreading from one patient to another patient. It can be reduced the painful time for patients and it can be easily measured. A simple working prototype was developed to measure the parameters using sensors and this information travelled through the system with the help of Zigbee transceiver. In future medical applications, this project can be improvised, by incorporating ECG monitoring systems, dental sensors and annunciation systems, thereby making it useful in hospitals as a very efficient and dedicated patient care system

## Conflicts of interest

Authors declare no conflict of interest.

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