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New Perspective for Health Monitoring System

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***Abstract*: Nowadays, the biomedical instrumentation holds a prominent position within medicine. Following this trend, the BPM (beat per minute) has become an important tool to elucidate about the functioning of the organism and wakeup for anomalies by monitoring the heartbeat in the human body. These devices are mostly used in hospitals and clinics but are gradually finding their way into domestic use. This paper demonstrates on an approach to design a cheap, accurate and reliable device which can easily measure the heart rate of a human body and as well as to easily measure the body temperature.**

***Key Words:* GSM, Heartbeat, and LPC2148, LM35.**

I. INTRODUCTION

1.1 Introduction on our Project:

The vigorous development of e-health, increasing number of mobile devices such as smart phone and iPad are capable of monitoring and diagnosing health status. By offering flexibility and mobility for healthcare, these portable devices bring effective prevention and detection of cardiovascular
diseases (CVDs). Unfortunately, this takes along an incidental problem that such distributed mobile devices with limited database (DB) and knowledgebase (KB) are rather restricted to handle the numerous CVDs, complicated medical diagnosis and users' increasing requirements. Therefore, the mobile devices must turn to up-linked server as a backyard support and assistance center to tackle the bottleneck problem. The proposed overall functional diagram of the distributed e-health system is depicted

The entire system is composed of three sub-systems i.e. body sensor network and acquisition (BSNA) system; intelligent monitoring and diagnosis (IMD) system; as well as uplink, update and synchronize (UUS) system. Here UUS is specialized to provide backyard on-line assistance to support the functionality of distributed CVD diagnosis and enable remote communication between thousands home users, healthcare center, and hospital server. Firstly, with the aid of multi vital signs. Secondly, these biomedical signals will be delivered to mobile devices for further analysis and interpretation to obtain the pathological results and warning messages. Whenever it happens either the failure of diagnosis, doubt about the diagnostic results, require more detailed and precise diagnostic information or doctor's comments, or demand updating local DB and KB, the users can send help requests to the up-linked server. Meanwhile, a data package of the acquired multi vital signs and local diagnostic results as well as other pertinent recording information should be sent out together.

Finally, the up-linked server will call UUS system to manage these help requests and feedback demanded information to distributed devices. The communication between IMD and UUS should meet following technical specifications to get exact and timely feedback from up-linked server: 1) rapid and efficient data transmission; 2) with strict information security; 3) with high data fidelity; 4) affordable cost. However, the massive multimedia medical data generated during long-term monitoring and diagnosis would not only result in high transmission latency in bandwidth-restricted network but also bring a huge burden to the source-limited mobile devices.

Consequently, to ensure prompt and reliable communication between thousands mobile devices and support center, fast and accurate multi vital signs transmission using high efficient compression and decompression technique becomes the kernel of success or failure. Compression methods of biomedical signals can be divided into two categories: direct methods and transform methods. Direct methods are carried directly on original signals in time domain.

The main disadvantage of direct methods is that they are sensitive to sampling frequency, quantization levels, and high frequency interference. In addition, these methods usually fail to achieve high data reduction along with the preservation of clinical information. Instead, transform methods such as Hermite transform, Fourier transform, discrete cosine transform, Walsh transform, Karhunen-Loeve transform, and wavelet transform exhibit higher compression ratio than direct methods. However, most of them are particularly application oriented and inept for multi vital signs. Even though some works claim to be potential of compressing more than one kind signal, neither theoretical nor experimental results have been presented to support the hypothesis.

Hence, for distributed e-health system where multi vital signs are employed during analysis and diagnosis, a universal compression method is necessitated desperately to release the requirement of more power and resource consumption brought by using separate compression method for individual vital sign. This paper presents a high-fidelity multi vital signs transmission method for distributed e-health applications, which employs a versatile and reliable compression technique based on adaptive Fourier decomposition (AFD). Thorough experimental results validate the compression performance. In addition, an intelligent signal type detection and auto parameter adjustment scheme is designed and implemented to cater for the transmission of different biosignals automatically.

II. PROPOSED WORK

2.1 PROPOSED METHOD:

Design and Implementation of Heart Rate Measurement Device using Wireless System.A fingertip sensor, which contains an IR light emitting diode and IR photo detector receiver. Using this device the heart rate signal can found. After getting the signal, it must be amplified, because the signal amplitude is very low. This is done using amplifier circuit. Then the amplified signal is counted by the counter using microcontroller. Finally, the signal is transmitted by the GSM.Then signal will be shown on the 16*2 LCD display at patient module.

After transmitting the heart beat signal, it is received by the USER receiver. If any critical situation the user or doctors will alert immediately.

2.2 MERIT:

The microcontroller based heart beat monitoring system using fingertip was developed to make the portable device and cheaper. A doctor can use this technology from any remote place like villages. Any non professional educated person can also operate that device. So the designed heart rate device is cheap in terms of cost also easier to understand.

2.3 DEMERIT:

Monitoring vital physiological signals such as heart rate, pulse transit time and breathing pattern, are basic requirements in the diagnosis and management of various diseases. Traditionally, these signals are measured only in hospital and clinical settings.

2.4 Block Diagram

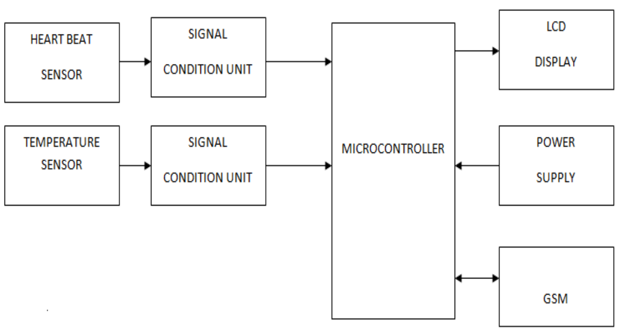

Figure 2.1: Block Diagram

2.5 Embedded Processor:

In the proposed work, LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

The features of LPC214x series controllers8 to 40kB of on-chip static RAM and 32 to 512kB of on-chip flash program memory.128 bit wide interface/accelerator enables high speed 60 MHz operation. In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms. Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high speed tracing of instruction execution. USB 2.0 Full Speed compliant Device Controller with 2kB of endpoint RAMS. In addition, the LPC2146/8 provides 8kB of on-chip RAM accessible to USB by DMA. One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel. Single 10-bit D/A converter provide variable analog output. Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog. Low power real-time clock with independent power and dedicated 32 kHz clock input. Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400kbit/s), SPI and SSP with buffering and variable data length capabilities. Vectored interrupt controller with configurable priorities and vector addresses. Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package. Up to nine edge or level sensitive external interrupt pins available. On-chip integrated oscillator operates with an external crystal in range from 1 MHz to30 MHz and with an external oscillator up to 50MHz. Power saving modes include Idle and Power-down. Individual enable/disable of peripheral functions as well as peripheral clock scaling for additional power optimization. Processor wake-up from Power-down mode via external interrupt, USB, Brown-Out Detect (BOD) or Real-Time Clock (RTC). Single power supply chip with Power-On Reset (POR) and BOD circuits:CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

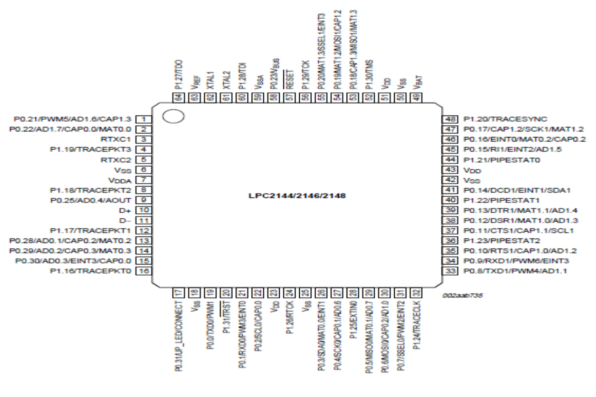

Figure 2.2: LPC2148 Pin Diagram

2.6 MAX 232 (Communication Interface):

RS-232 (Fig. 4.) was created for one purpose, to interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE) employing serial binary data interchange. So as stated the DTE is the terminal or

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computer and the DCE is the modem or other communications device. RS 232 is the most widely used serial I/O interfacing standard. In RS 232, a 1 is represented by -3 to -25 v. while a 0 bit is +3 to + 25 v, making -3 to +3 undefined. For this reason, to connect any RS 232 to a Microcontroller system we must use voltage converters such as MAX 232 to convert the TTL logic levels to the RS 232 voltage level, and vice versa.

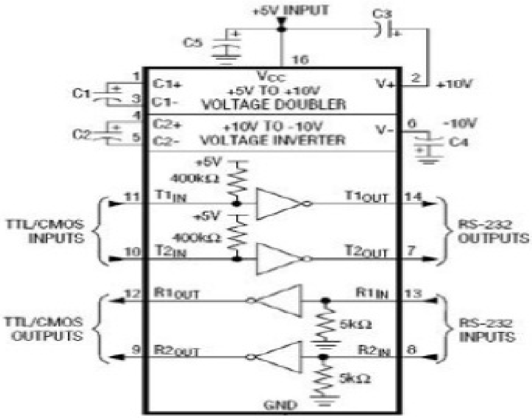

Fig 2.3. Operating Circuit of MAX 232

This chip is used when interfacing micro controller with PC to check the Baud rate and changes the voltage level because micro controller is TTL compatible whereas PC is CMOS compatible.

2.7 LCD Interface with LPC2148:

The system also consists of a display system having in corresponding response display information on LCD. LCD module has 4-bit data interface and control pins asshown in Figure 3. In this display hardware interfacing with any pin of microcontroller with 4-bit mode in this mode we have 4 data lines and 3 control lines that is D0,D1,D2,D3 and RS,RW,EN pins. RW pin is make it ground why because of we use to write data on LCD that's why RW=0 always Zero. In this display we can display total character at a time 32 characters.

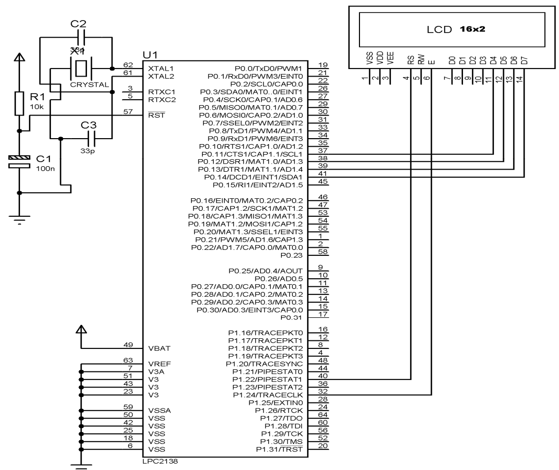

Fig 2.4 LCD interfacing with microcontroller

LCD display used here is having 16x2 sizes. It means 2 lines each with 16 characters.

III. EXPERIMENTAL RESULTS

3.1 Results

3.1.1 KEIL uVision4

Many companies provide the ARM assembler, some of them provide shareware version of their product on the web, KEIL is one of them. We can download them from their websites. However, the size of code for these shareware versions is limited and which assembler is suitable for our application is to be considered. KEIL uVision4 is used for this implementation.

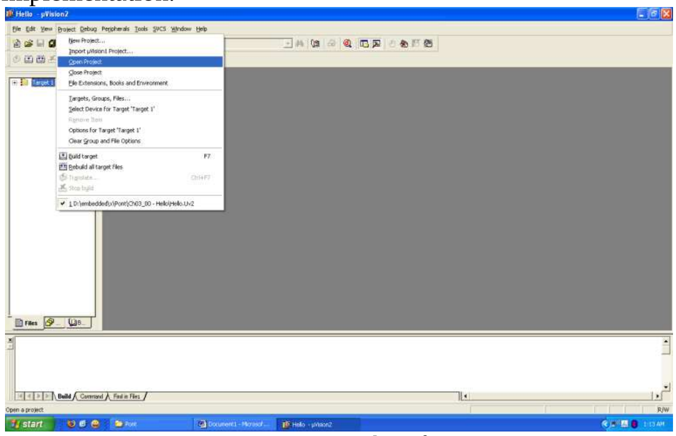

Figure 3.1: Project template of uVision4

KEIL is an IDE (Integrated Development Environment) that helps to write, compile, and debug embedded programs. It encapsulates the following components a project manager, a make facility, tool configuration, editor and a powerful debugger. The figure 2.11 shows the project template of uVision4 which is used for writing the code in embedded-C.

3.1.2 Flash Magic Tool

Flash Magic is a tool which used to program hex code in EEPROM of micro- controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. You can burn a hex code into those controllers which supports ISP (in system programming) feature. To check whether the micro-controller supports ISP or not take look at its datasheet. So if the device supports ISP then it can be easily burn a hex code into EEPROM of the device. Flash magic use Serial or Ethernet protocol to program the flash of device.

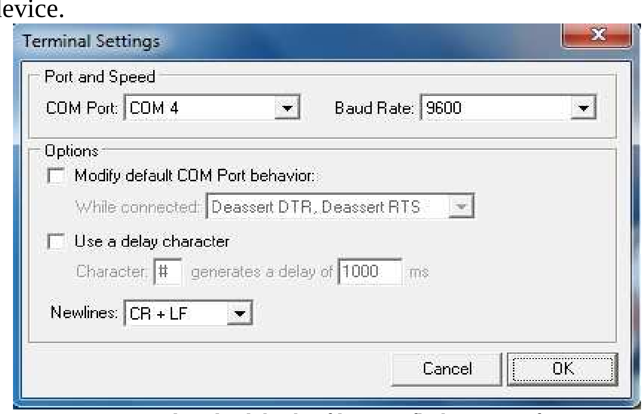

Fig. 3.2: To download the .hexfile using flash magic software

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Fig. 3.3: Project kit

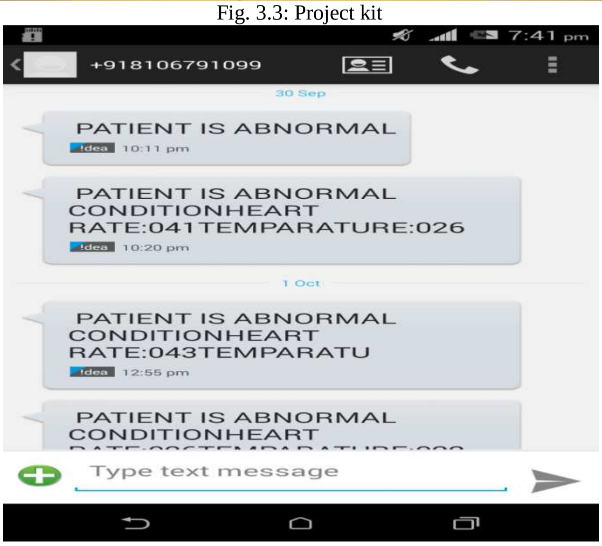

Fig. 3.4: Output

IV. CONCLUSIONS

The proposed method exhibits universal and robust applicability for multi vital signs and achieves competitive performance compared with prior works, making distributed e-health applications be realistic. These devices are mostly used in hospitals and clinics but are gradually finding their way into domestic use. This paper demonstrates on an approach to design a cheap, accurate and reliable device which can easily measure the heart rate of a human body and as well as to easily measure the body temperature.

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