

Health Monitoring System for Soldiers using UTLP Kit

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ABSTRACT: Indian Medical Service says by 2000 Indian troops had no station hospitals facilities and it needs to depend entirely on the regimental hospitals. Later, the Indian army medical corps provides lifesaving services in army camps. The Indian armed forces through the directorate general of armed forces medical services has undertaken a program for health care facilities. Health surveillance of the military personnel was done through annual medical checkups. Because of irregular monitoring of health condition, soldiers were facing lot of health problems. To overcome these problems a system was introduced in this paper, which is used to check the soldiers health conditions regularly. In this system the bio sensors are used to sense the vital parameters of soldiers such as temperature, blood pressure, pulse rate and these parameters which was measured continuously was wirelessly transmitted using GSM. This can be processed by ARM 8 Cortex processor and implemented in Spartan 6 FPGA by Unified technology learning platform.

KEYWORDS: Advanced RISC Machine (ARM), Health Monitoring System (HMS), Indian soldiers, Unified Technology Learning Platform (UTLP).

I.INTRODUCTION

Wireless technology had been improved the way we live, but the patient in the remote area is critical one for example soldiers are working in military. The main aim of our project is to monitor the soldier's health at remote areas using GPS-GSM module and soldier's health information sends to the military doctor. The wearable bio-sensors are attached to the human body to measure the soldiers conditions are analyzed using the parameters such as temperature, blood pressure, and pulse rate.

In rural areas, there are physicians with the exemption of the family and general practitioners of all the regions of nation. The main difficulty is that recruit and retention of primary care providers. According, to the U.S estimation in 15% of adults were not preferring doctor office, clinic, related to the health care.

The people in living in rural and remote area are struggle to access quickly and quality of medical care in the world wide. In the meantime, the information deliver to the doctor of health care service via communication technology has been developed in more and it is tested then it is implemented in specific fields.

In a specific perspective, the cost is differing for communication services between urban and rural areas. Telecommunications Act of 1996 contains provisions that, once fully implemented, will alleviate this problem.

Nowadays Defence services are rapidly growing towards new innovation with advance implementation. Soldier's health is more important because they are the defenders who protect our country. The system is composed of two parts, which are portable remote soldier unit and the monitoring center. The portable remote soldier unit consists of Advanced RISC Machines (ARM) with the embedded operating system, GPS and a GSM, temperature sensor and heart beat sensor.

Rubina.A.shaikh [1] et al. proposed a system in that critical health condition has been tracked in real time. The health monitoring system in a real time for patient uses zigbee, GSM, GPS, ARM 7 TDMI-S processor and sends

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information about patient critical situation via SMS to the doctor and patient relatives also. The system will monitor continuously transmits wirelessly to the doctor. The system monitors patient's vital parameters such as Temperature, ECG, Heartbeat pulse signals. These parameters are processed using ARM 7processor from Texas.

Purnima[2] et al. described that every day many lives are affected by heart attacks and more importantly because the patients did not get timely proper help. The proposed system based on patient monitoring in real time. It enables the doctors to monitor patient's health parameters (temp, heartbeat, ECG, position) in real time. Here the parameters of patient are measured continuously (temp, heartbeat, ECG) and wirelessly transmitted using Zigbee. The patient health is continuously monitored and the acquired data is analyzed at a centralized ARM microcontroller. If a particular patient's health parameter falls below the threshold value, an automated SMS is sent to the preconfigured doctor's mobile number using a standard GSM module interfaced to the ARM microcontroller. The Doctor can get a record of a particular patient's information by just accessing the database of the patient on his PC which is continuously updated through Zigbee receiver module.

B.Jyosthna [3] et al. described that medical emergency assistance system is continuous monitoring of health conditions and send the information regularly to the hospital. This system implemented in the emulator with GSM.communication between hospital and the device is by GSM technology. It enables the doctor to monitor patients parameters(temp,heartbeat,ECG) in real time through on SMS.The existing system are huge in size. Regular monitoring of patient is not possible once he/she is discharged from hospitals. The system is able to transmit the parameter of patient continuously and over long distance wirelessly.Temp, ECG, Heart beat pulse signals are measured from the temperature.These measured parameters are processed by ARM processor and transmitted by GSM wirelessly.

Ketaki N.patil [4] et al. presents that the development of patient monitoring is of great importance in todays stressed and busy world where people even don't have time to visit doctors again and again. The system uses the key concept of wireless sensor network and focuses on ECG signal. The main processing element used is ARM7and ECG signal is efficiently received on PC in MATLAB at doctor workstation. It is possible to transmit different data like temp, ECG, pulse rate by using wireless technology and also give warning signal with the use of GSM modem.

Abid khan [5] et al. described that to determine the precise location of an object, person or other asset to which it is attached and using GSM modem. This information can be transmit to remote user. The system equipped with GPS and GSM modem along with ARM processor that is installed in vehicle. The use of GSM and GPS technologies allows the system to track object and provides the most up to date information about ongoing trips. During object motion its location can be reported by SMS message.

Recent advances in wireless communication gives a new era for monitoring patient critical health condition in real time.Komal Honda [6] et al. described that care of critically ill patient requires continuous monitoring. This system is used for continuous monitoring of ICU patient in real time. It enables doctor to monitor patient parameters in real time using HTTP protocol. ARM processor, GSM/GPRS UART modem has been used. The data's are transmitted to PC by establishing HTTP connection via GPRS.

Sirisha [7] et al. described that mobile multi patient monitoring device has become increasingly important in hospital wards to record real time during normal activity for better treatment. This system enhancing solution for improving performance and power management of the real time patient monitoring(MPMS).A Zigbee node is connected to every patient, it was sending the vital information of the patient(heartbeat , body temperature,etc) and periodically sends those vital parameters to centralized server ARM. The Doctor is continuously conned to ARM server using GSM module and can get a record of particular patient information by SMS to the centralized ARM server.

P.S.Kurhe [8] et al. presents that every year soldier become lost or injured due to the critical health condition problems. He had been developed a system for remote soldiers and that can be supplemented with real time wireless monitoring system which are implemented through GPS network and are able to record and transmit bio signals of soldiers. It gave the medical monitoring for a soldier who is working in remote area, using GSM and GPS at any time at any place.

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II BLOCK DIAGRAM

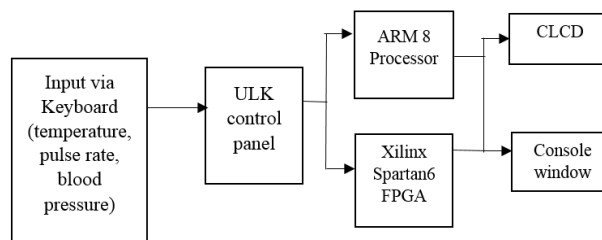


Fig.1. Block diagram of Health monitoring system

Description

The block diagram of interface system is shown in figure 1. The program is coded and compiled using eclipse software. After compilation, the ULK control panel is interfaced to the UTLP kit. The code is loaded in control panel to run the system. It is processed by using two devices. They are ARM 8 processor and Xilinx spartan6 FPGA. According to the given input, the output is displayed in console window, Character Liquid Crystal Display, Graphical Liquid Crystal Display and via audio output.

Eclipse

Eclipse is multi-language software which is developed by development environment tool including an integrated development environment (IDE) and an extensible plug-in-system. It is written mostly in Java. It can be used to develop the applications in Java program and, by means of various plug-in systems, other programming languages including Ada, C, C++, COBOL, FORTRAN, Haskell, Perl, PHP, Python etc. Eclipse IDE tool is a tool which is used for developing applications based on C language for UTLP.

ULK control panel

The ULK (Unified Learning Kit) control panel is an application program and it is developed using ubuntu development personal computer which facilitates the communication between the Ubuntu Host personal computer and the UTLP. It also enables downloading and executing the UTLP program in usual mode. Fig 2, shows the host and client interface.

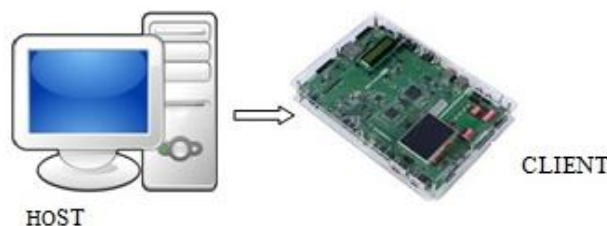


Fig.2. Host and Client Interface

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ARM 8 processor

The ULK is based on Texas Instruments ARM 8 application processor and Spartan-6 FPGA. The Texas Instrument ARM 8 processor is a high performance processor which is based on ARM architecture. It is used to support high-speed devices and number of thread processing application. The ARM 8 processor supports TI OMAP 3530 SOC, ARM Cortex A8 600MHz CPU, DM64X+ 430MHz DSP, Xilinx Spartan-6 LX25T FPGA, 128MB CPU RAM –mDDR, 64MB FPGA RAM-DDR2, 128MB NAND FLASH, PowerVRSGX Graphics, Video OUT-VGA, LCD-local/external, AV Support, TV Out, Video IN-Camera, Audio in, audio out, stereo out, Boot Loader, Xloader, Uboot, Operating Systems, Linux X11 (Graphics), Eclipse IDE & XILINX ISE Web Pack, Peripherals 3.5" TFT LCD with Touch screen, Seven Segments LED, Dual line character LCD, ADC, DAC & Flexible IOs, External-Bluetooth, Wi-Fi, GPS*, DIP switches, Onboard RTC, Connectivity UART, I2C, McSPI, McBSP, USB 2.0 OTG, Ethernet (10/100Mbps), JTAG support for CPU and FPGA, API Support for debug & ULK Control panel.

Spartan-6 FPGA

Spartan 6 FPGA has 2 mega byte of SPI PROM from Atmel. Then, it has 10 bit ADC with parallel interface and 12 bit DAC with parallel interface. It contains JTAG interface, 7-segment LED's, 20 pin header and 70 pin I/O expansion connector, DIP switches and Status LED's.

A. UTLP- Interfaces

UTLP has different devices and interfaces which can be accessed both in the normal mode and in the lab mode. ULK by default comes with 3.5 inch Graphics LCD with touch interface. ULK has the option to connect external bigger LCD's through Photo Frame add on board. ULK supports 7" Graphics LCD + Touch panel for photo frame or HMI applications. Images stored in SD Card / USB Memory stick can be displayed in external 7" Graphics LCD. This can also be used as an alternative to on-board 3.5" LCD display. GSM/ GPRS Add-On Board consist of a GSM module and a SIM slot. One can access the GSM network and also get connectivity through GPRS. Since GSM/ GPRS Add-On Board gives access wide GSM/GPRS network, several innovative projects can be implemented. The projects may include applications involving webserver, internet connectivity, transfer of messages, commands over GSM network etc. Bluetooth Interface Board consists of a Bluetooth module and required interfaces to connect with ULK.

API stands for Application Programming Interface. APIs are the functions provided by interface libraries. By using these library calls in the programs for an interface functionally. At the linking time, the API library binaries to make an executable program. In the UTLP normal mode, there are interface libraries provided for different devices and functionality.

Reads a string from the control panel input window-

Void ulk_scanf_string(char*user_string)

Outputs a string on the serial port-

Uin8 ulk_printf(const char*fmt....)

Prints a string in the control panel output window-

void ulk_cpanel_printf(const char*fmt...)

Reads a hex value from the control panel input window-

void ulk_scanf_hex(unsigned long*hex_variable)

Character LCD

A 16x2 LCD shows to display 16 characters per line and has 2 lines. Each character is displayed in 5x7 pixel matrix. Character LCD interface is shown as Fig.3. The 16x2 character LCD is connected through the I2C interface.

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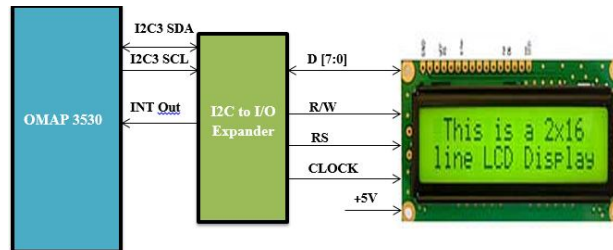


Fig.3. Character LCD

7 SEGMENT LED DISPLAY

The Seven segment LED is used to display the characters. The 7 Segment LED have many applications such as digital clocks, electronic meters, basic calculators and other electronic devices that display numerical information etc., Fig.4. Shows the 7 Segment LED display.

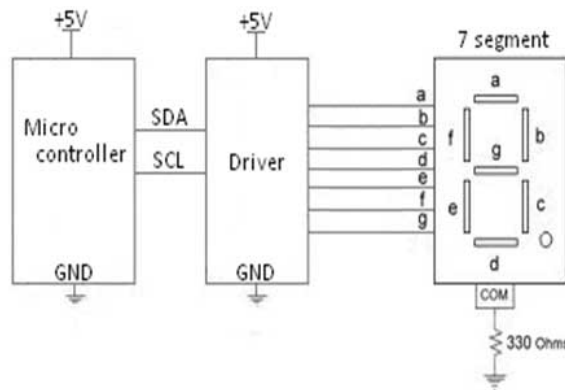


Fig.4. 7 Segment Display

Touch panel

The touch screen analog signals from the external LCD will be interfaced with touch screen controller through 4 pin 2.54mm pitch header. The touch screen analog signals from the 3.5inch LCD will be interfaced with touch screen controller through the 54pin LCD connector itself. The 4-wire, 12bit resolution, low voltage touch screen controller TSC2046IPWR from TI is used.

Implementation

The ARM-8 Cortex processor, based on the ARMv7 architecture, has the ability to scale in speed from 600MHz to greater than 1GHz. The Cortex-A8 processor can meet the requirements for power-optimized mobile devices needing operation in less than 300mW.

The program has been implemented in Unified Technology Learning Platform kit display. An output can be displayed on CLCD and 7 segment LED display with the help of API which is coded using Eclipse software.

III .RESULTS AND DISCUSSION

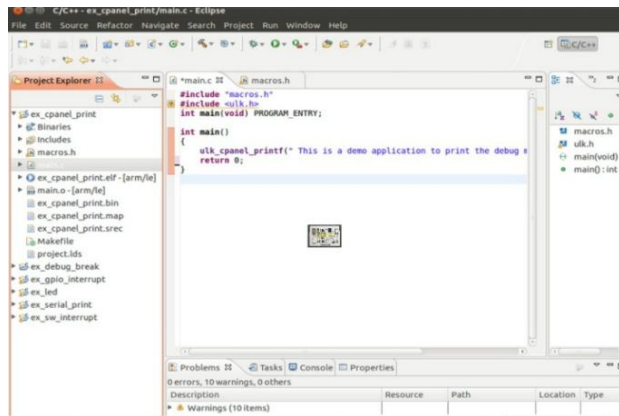
The program written in Embedded C was executed using the Eclipse software. C application program window is shown in the figure 6a. After successful execution, it is interfaced with the UTLP kit through ULK control panel. Fig.6b shows the execution window of the ULK panel where the program was interfaced with the kit. ULK load and execution operation was done in the ULK panel, it was shown in the fig.6c. The output was displayed in the console

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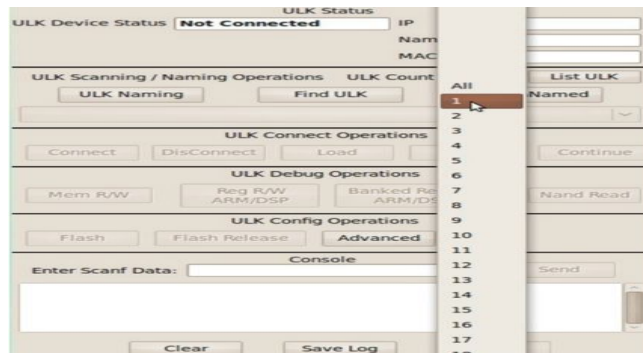
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window shown in the fig.6d, as well as in the CLCD as PHM System (Patient Health Monitoring System) as shown in fig.6e. As fig.6e, depicts the 7 segment display for Patient health monitoring system.



(a)



(b)

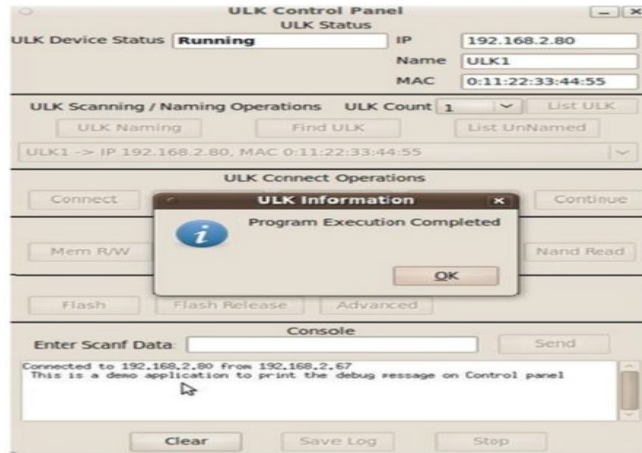


(c)

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(d)

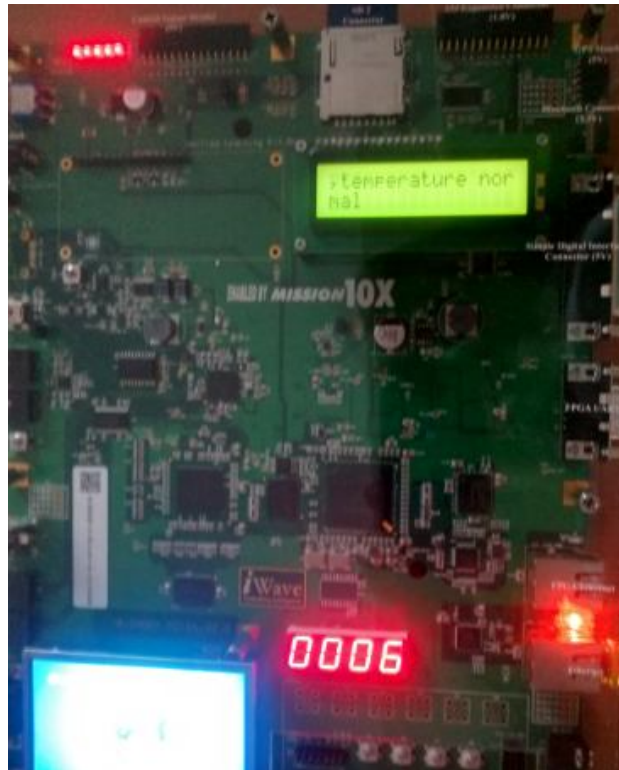


(e)

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(e)

Fig.6. (a) Eclipse Software program window, (b) ULK Control panel,
(c) ULK Load operation, (d) Character LCD Output,
(e) Unified Technology Learning Platform (UTLP) kit

IV. CONCLUSION

This paper improves the monitoring of soldier health condition with available resources. The most important part of the paper is that it monitors soldier's conditions at remote areas rather than the stationary soldiers at army stations. The parameters considered for monitoring soldiers condition such as temperature, pulse rate, blood pressure. This has been synthesized using eclipse and it is implemented in UTLP kit. This system ensures that soldiers receives medical attention just in time. This system can be further developed in future by adding GSM and GPS features to track the location of soldiers at Remote areas. The feature of this project can be enhanced by enabling the audio message to the nearby army station doctor through mobile.

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