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Remote Patient Monitoring System for Rural Population Using Ultra Low Power Embedded System

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Abstract— The planned a model that analyses numerous Bio-medical parameters like temperature and force per unit area and heartbeat obtained from the sensors used &with the assistance of a MSP430-microcontroller, all the parameters obtained are displayed on associate liquid crystal display screen. supported the parameters obtained the patient is incessantly monitored and if just in case of any important mishap once the parameters exit of a specific vary then it's prevented by the care system connected to the Patient observance System. the first perform of this method is to sense the temperature and heartbeat of the patient and detected information is shipped to the embedded processor port. The processor is programmed to continue monitor the information and send GSM module is employed mobile message show and therefore the actuation signals to patient care system.

Keywords —Bio Signals, GSM Module, MSP-430microcontroller, Sensors.

I. INTRODUCTION

It has been long recognized within the health care trade that semi permanent, continuous observance could be a key component in preventive take care of individuals with chronic conditions like heart perform. A typical example of patient observance could be a home care device, like Associate in nursing electronic pressure level or aldohexose meter. Associate in nursing ambulant system that enables semi permanent observance of mobile patients is additionally fascinating. The ambulant graphical record (ECG) Holter device, used since the Sixties, provides a reliable activity of the wearer's heartbeat however is significant Associate in nursing cumbersome to wear over an extended amount of your time. Additionally, its substantial power consumption forbids continuous operation victimization low-capacity batteries. In recent years, light-weight devices have emerged as a viable technology for continuous activity of significant medicine parameters [7].

Wearable, biosensors connected to self-organizing permits physicians to endlessly monitor important signs, and help in preventing any important mishap and conjointly helps physicians to record semi permanent trends and patterns that offer valuable info a few patient's in progress condition, simple Use [1]. The supply of advanced sensing devices combined with sophisticated; self-organizing care system can modify new applications and represents a big chance for remote health observance. This technique can serve three needs the primary could be a immovableness issue in order that these health observance devices will match or attach simply to a carpus or arm band, ring device. The second demand is very low power in order that tiny batteries may be used for an extended amount of your time. The third demand could be a extremely subtle protocol for low latency, high measurability and high responsiveness.

II. DESCRIPTION

Various biometric signals are sensed by the sensors and sensed signals are conditioned through signal conditioning circuits. After getting the appropriate shape and value these bio signals are converted in to digital signals for processing. Embedded processor continues monitors this bio signals and displays their values on LCD times to time. Any variation in these signals makes processor to send the actuating signals to patient caring system.

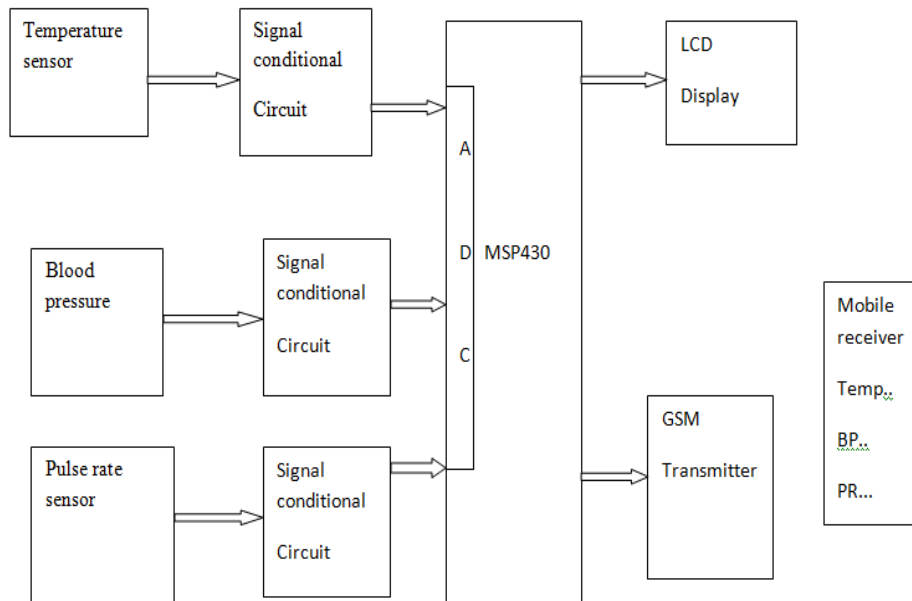


Fig.1 block diagram

III. COMPONENTS USED

The whole system is composed of three components sensing, processing and actuating. Apart from these components, the signal conditioning circuit, local display system and programmed algorithm are also integrated part of this application specific embedded system. A few components are discussed below

A. Microcontroller

The MSP430 MCU clock system has the ability to enable and disable various clocks and oscillators which allow the device to enter several low-power modes (LPMs). The flexible clocking system optimizes overall current consumption by only enabling the required clocks when appropriate. This means that MSP430 MCUs can operate for decades on a single coin cell battery.

- 1) Used to display Biomedical Parameters on LCD.
- 2) It is also used to interface the temperature sensor, the heartbeat sensor and blood pressure the LCD.

B. Liquid Crystal Display

Display used here is the LCD display. It is an intelligent LCD. It is a 16*2 LCD, which displays 32 characters at a time 16 will be on the 1st line and 16 will be on the 2nd line. There are two lines on the LCD and it works on extended ASCII code i.e. when ASCII code is send it display it on the screen. On the LCD total no of pins are 16 out of which 14 pins are used by the LCD and 2 are used for backlight. LCD is an edge trigger device i.e. from high to low. The data can also be monitored on mobile devices using DTMF [4].

C. Temperature Sensor

In this a precision centigrade temperature sensor LM35 is used. It is a precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature [2]. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. For every °C change in temperature, it shows a variation of 10mV in the output [3].

D. Heart Beat Sensor

A Heart Beat Sensor is implemented with a pair of LED and LDR. (Fig.2). this transducer works with the principle of light reflection, in this case the light is infrared.

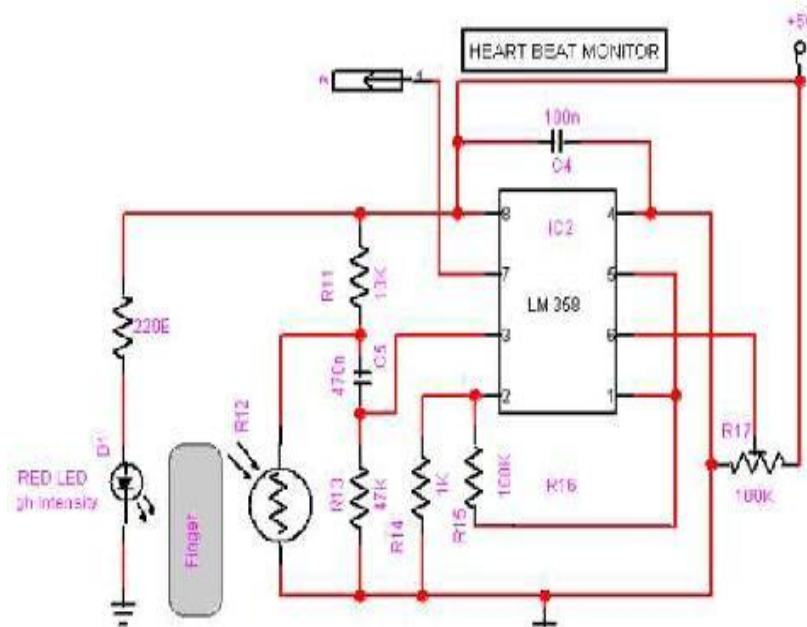


Fig 2. Heart Beat Sensor

C. GSM Module System

In this part we have implemented the mobile application for the multiparameter value are display the any rural area to medical care system. GSM system is the more sophisticated and the most widely used of a long-distance wireless communication system in mobile communication system that based on TDMA technology. GPRS is General Packet Radio Service for short, which is a data transmission technology that is based on GSM.

IV. SOFTWARE IMPLEMENTATION

The software design is a key element in the development of a project. For visualization of the different parameter on the LCD display, the microcontroller is burnt in assembly level language. The microcontroller chosen for the development of the system is MSP430. The MSP430 has 8K bytes of Flash programmable and erasable read only memory (EPROM) and has the capability to write to its own memory. The use of a FLASH device for development also provides the option to use FLASH microcontrollers in the final design making the system fully upgradable. This allows modification of the microcontroller software to expand.

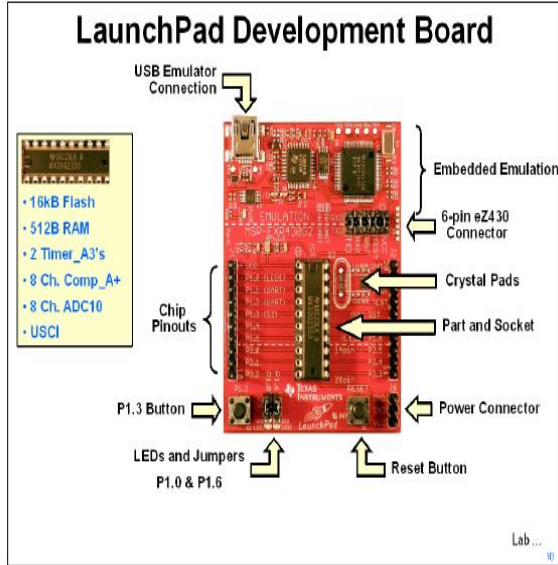
A. Software tool:

- **Code Composer studio**
 1. CCS Editor
 2. Debugger

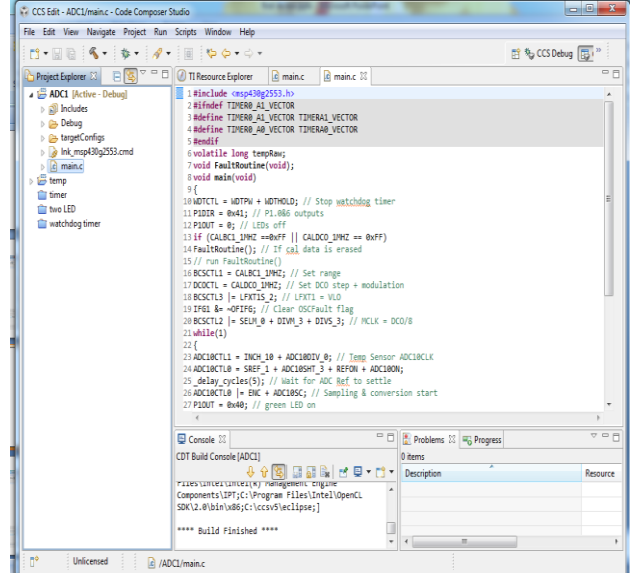
CCS v5.x is a major new release of Code Composer Studio that is based on the Eclipse open source software framework. Eclipse content has not been modified thus it supports integration with many different plugins. Code Composer streamlines the design process with a more intuitive interface combined with leading C code density and powerful debugging capabilities. Major upgrades include optimizations and improvements focused on improving design flow, simplifying debugging and verification and speeding time-to-market while keeping system costs low.

New target configuration files may be created from File -> New -> Target Configuration menu. If you have a project selected in Project Explorer view, then target configuration wizard will use that project as the location where to create this file. User may adjust it. Alternatively, target configuration files are created in default location. If target configuration file is added to the project, then it will be automatically used by the debugger when the starting a debugger action is selected. Setup Editor allows users to create target configuration files using basic tab where simplified selection are available (i.e. select connection and board/device). Setup Editor may also be used to configure target settings from scratch using advanced tab in Setup Editor. One of these configurations can be designated as your *Default Target Configuration* using Target Configuration View (View->Target Configuration)

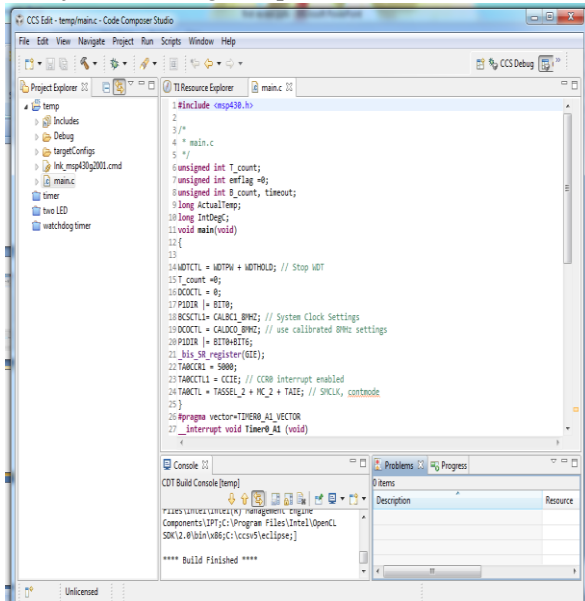
A. MSP430 Launch pad:



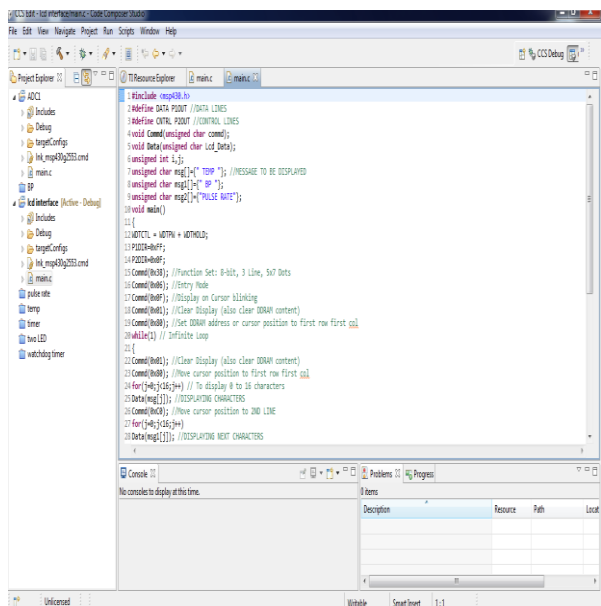
C. Software Coding-ADC program



D. Software Coding-Temperature Sensor:



E. Software Coding-LCD interface Program:



The proposed work is focused on body temperature measurement device and heart rate measurement monitor taking up the analog values using the sensor LM 35 and LDR and LED, these signals were fed into an ADC (Analog to Digital Converter) The digital value of the temperature measurement and heart rate measurement from the ADC is then fed to the MSP430 microcontroller. The LCD (Liquid Crystal Display) is interfaced with the microcontroller which displays the value of the temperature sensed and the heart beat. In case the values of the temperature and the heart beat goes out of a particular range prescribed by the doctor the relay gets triggered and hence the care system responds to GSM system as shown in fig.3

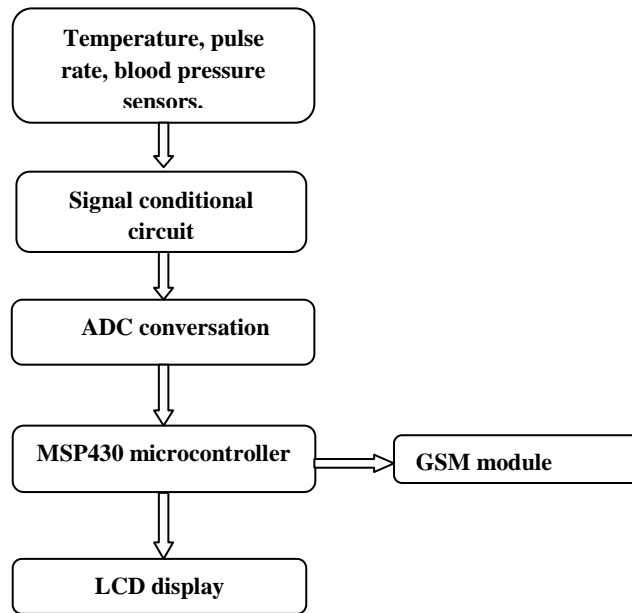


Fig.3. Flow Diagram

D. Classification and Its Clinical Significance

The system is designed to classify the signals into: 1) abnormal and 2) normal classes at the onset. The abnormal classes once screened are further classified into: 1) alular heart dis-eases (VHD), 2) ischemic heart disease (IHD),3) abnormal undetermined (Abu). The sub classification is based on frequency signatures of the HS and its temporal properties. The alular disorders can be easily picked up by identifying the murmurs in the segmented HS. we can find the evidence of a trial fibrillation. Ischemic heart diseases can be diagnosed when there is an early or late heart failure, S3 Gallop, or a loud P2 (loud P2 often indicates a pulmonary hypertension); an a trial septal defect is indicated by a split of second HS. Coronary stenosis is generally known to produce sounds due to turbulent flow of blood in the occluded arteries. Normally, the sounds are masked and are not audible clearly during the systolic phase but the same can be picked up by precision sensors during the relatively quiet diastolic phase [5].

V. HARDWARE IMPLEMENTATION

By using various electrical circuits the bio-medical like temperature and heart beat parameters can be found. The output of the circuits is amplified by means of an amplifier and fed into an A/D converter. The digitized signal is then fed into the input port of the microcontroller. The microcontroller displays the parameters in digital value in the display device. And the injector connected to the prototype works accordingly as shown in Fig. 5.

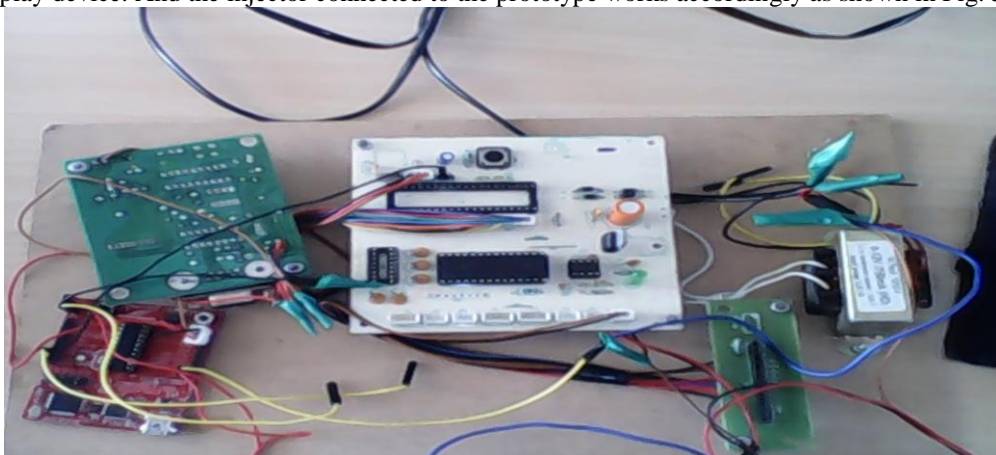


Fig.4. Hardware Implementation



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VI. CONCLUSION AND FUTURE SCOPES

The project has been completed inside the simulate timeframe with the airing medicine parameter and therefore the care system. We even have achieved the specified outputs of the temperature and therefore the heartbeat and force per unit area of the patient on the alphanumeric display displays and per that the care system i.e. the drug performs if these parameters quit of a selected set vary. Despite immeasurable analysis during this field of watching and care of patient, there has been little effort in actual implementation of the conception that provides sample scope for the any developments of this project.

Patient watching and care these days is quick turning into a typical reality. From viscous watching to polygenic disease management and additional, health care services that were once restrained inside doctors being round the patient twenty four hours are currently finding their spot underneath technologically sound and improved health care. The patients are taken care of and therefore the doctors are able to perform their job effectively too. To boot, it helps improve patient health, and GSM/GPRS network due to early identification and preventive care system.

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