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# Online Health Monitoring

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## ABSTRACT:
In the last decade the healthcare monitoring systems have drawn considerable attentions of the researchers. The prime goal was to develop a reliable patient monitoring system so that the healthcare professionals can monitor their patients, who are either hospitalized or executing their normal daily life activities. In this we design a system which is connected to a patient to know Temperature, Pulse Rate, and ECG. The data will be obtained from the Temperature Sensor; Pulse rate Sensor and ECG Sensor respectively, this data is given to the Controller. The Controller will communicate with PC using Serial Communication. The Readings of Patient will be displayed on PC and this PC can be used as a server.

## INTRODUCTION:
The electronics technology has entered almost in all aspects of day-to-day life, and the medical field is not exception for that. The need for well-equipped hospitals and diagnostic centers is increasing day by day as the people are becoming more conscious about their health problems. In biomedical fields special units are used, such as intensive care unit or coronary care unit. All of these units are designed to offer the advantage of the low Nurse - Patient ratio and concentration of the equipment and the resources needed; to take care of critically ill or seriously injured units. The medical world today faces two basic problems when it comes to patient monitoring, firstly the need of healthcare providers present bedside the patient and secondly the patient is restricted to bed and wired to large machines. In order to achieve better quality patient care, the above cited problems have to be solved.

As the technologies are advancing it has become feasible to design to home based vital sign monitoring system to display, record and transmit signals from human body to any other location. The computer based Signal Acquisition, processing and analysis system using ANDROID to display status. This paper discusses the aspects of acquisition of physiological Parameters like Saline level, Temperature, Body status, Heartbeat pre-processing them and displaying them in a graphical user interface for being viewed by the doctor and also observe the clinically useful data, Firstly on Doctors LCD and secondly on Android Mobile which contains a android application. This system is expected to monitor patient under critical care more conveniently and accurately for diagnosing which can be interfaced with computer 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 patient's bed.

## OBJECTIVE OF THE PROJECT:
The prime objectives of this system are as follows: (a) it saves the patients' time and effort by reducing their back and forth travel to health clinics, (b) it provides the patients with an opportunity to save their lives by sending them critical situation message, and (c) it also assists the healthcare professionals and relatives to monitor the patients from a remote location.

## AIM OF THE PROJECT:
The main aim of the project is to design and implement a Tele-Health Monitoring System. Now a day's healthcare industry is to provide better healthcare to people anytime and anywhere in the world in a

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more economic and patient friendly manner. In the present project the physiological parameters such as Body Temperature, Pulse Rate and oxygen level of blood are obtained, processed using ARM7 LPC2148 processor and displayed on display user interface and also transfer status using Ethernet module.

## LITERATURE SURVEY:

The gadgets innovation has entered in all parts of normal life, and the restorative field is not special case for that. The requirement for very much prepared clinics and symptomatic focuses is expanding step by step as the individuals are getting to be more cognizant about their wellbeing issues. In biomedical fields unique units are utilized, for example, emergency unit coronary consideration unit. These units are intended to offer the benefit of the low Nurse – Patient proportion and amassing of the gear and the assets required; to deal with basically sick or genuinely harmed units. The restorative world today confronts two fundamental issues concerning patient checking, firstly the need of human services suppliers present bedside the patient and furthermore the patient is confined to informal lodging to expansive machines.

Keeping in mind the end goal to accomplish better quality patient care, the above referred to issues must be understood. As the innovations are propelling it has ended up plausible to outline to Horne based basic sign observing framework to show, record and transmit signals from human body to whatever other area. Framework is relied upon to screen persistent under basic care all the more advantageously and precisely for diagnosing which can be interfaced with PC to bring it under a system framework broadly for the specialist to screen the understanding's condition sitting in his own particular office without being physical. Tele health monitoring is originated from home health care system which is the by-product of Oxford HealthCare came in existence since 1974. However, it becomes popular in last few decades. Tele health monitoring can be divided into three main groups are:

- Acquisition and transmission- It includes acquisition of physiological data of patient, storing and processing it in an electronic device specifically memory devices and microcontroller and transmitting the signal whenever needed. It does not need synchronization between medical staff and the patient. It is mainly used for dermatological treatment.
- Distant monitoring- It includes synchronized transmission of physiological data to the health centre. It is used mainly in the cases of patient suffering from cardiovascular diseases.
- Two-way communication services- It includes telephonic conversation or video conferencing of patient with medical personnel.

### Similar Projects

### Design and Implementation of Real Time Embedded Health Monitoring System using Wi-Fi:

Now a day's healthcare industry is to provide better healthcare to people anytime and anywhere in the world in a more economic and patient friendly manner. In the present paper the physiological parameters such as Heart beat, Saline level, Patient status and Temperature are obtained, processed using ARM7 LPC2148 processor and displayed on monitor user interface and also transfer status using android. In any vital parameter goes out of normal range then alert SMS will be sent to Doctor Mobile. This system is utilizing android software and low cost component to transmit ECG data to physicians for monitoring, diagnosis and patients care at a significantly low cost, regardless of patient's location.

### Design and Implementation of Real Time Embedded Health Monitoring System using Li-Fi technology:

Now a day, health and patient monitoring is very tedious job to do. The monitoring personnel have to watch continuously. They have to keep monitoring the patients, who are admitted in Intensive Care Unit (ICU).

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These patients are in serious illness conditions and can't be said what happens in next instance to them and today increasing the number of patients in the ICU due to many increasing fatal diseases. These diseases are threatening the population all over the world. Doctors need more conscious about the patient health status. The health monitoring system proposed here gives doctor continuously updated health information of patient using various sensors used to monitor health of patient. It allows doctors to monitor patient over the long distance and also to consult others. Li-Fi technology is used here in to update information quickly and it can be viewed at monitor of the doctor. Simultaneously it also records the data of patient in the CPU. This data can be viewed through the internet for reference while consulting the patient.

## EXISTING SYSTEM:

In the existing system, the sensors data was taken and those digital values are displayed on the LCD screen. If the doctor want to know the patient condition from his cabin itself, it was not possible. So, we implemented this proposed method, in which the doctor can know the particular patient condition from his cabin by just opening the HTML page.

## PROPOSED SYSTEM:

In this proposed method, we are using the Ethernet module, to send the patients health parameters like body temperature, heart rate and oxygen levels in the blood are to the HTML page and on LCD screen as well. So, if the doctor wants to know about particular patient health condition, he simply opens the HTML page by entering its IP address in the web browser.

## DESIGN AND DEVELOPMENT OF THE SYSTEM:

## BLOCK DIAGRAM:

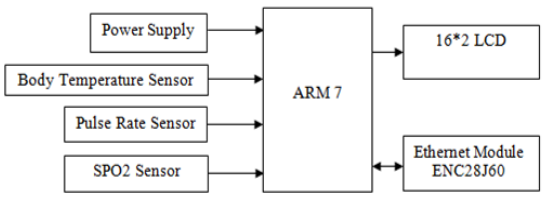


**Fig 2.1: Block diagram of proposed system**

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-SCPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32 kb to 512 kb. A128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kb up to 40 kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

## ARM7 MICROCONTROLLER:

ARM is an acronym for advanced RISC machine and is manufactured by Phillips. ARM7 is based on reduced instruction set computing architecture. ARM7 is most successful and widely used processor family in embedded system applications. The advantage of low power consumption and low cost increases the range of applications from portable devices to almost all embedded electronic market. It is preloaded with many in-built features and peripherals making it more efficient and reliable choice for an high end application developer. It also supports both 32-bit and 16-bit instructions via ARM and THUMB instruction set. LPC 21XX series of microcontroller are based on ARM 7 TDMI – S architecture.LPC stands for Low Power Consumption, because for the reason it have different voltages for operation and not like other controllers where the entire controller (CPU + peripherals of controller operate at +5V Vcc). The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro-

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programmed Complex Instruction Set Computers. This simplicity results in a high instruction throughput and Impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory.

### Pin Diagram:

ARM7 LPC2148 microcontroller is a 64 pin dual-in package. There are basically 2 ports in LPC2148, Port0 and Port1. Port0 has 32 pins reserved for it. And Port1 has 16 pins. So total it comes to 32+16 = 48 pins. If it were really 2 ports then the number of port pins should have been 32 + 32 = 64 pins.

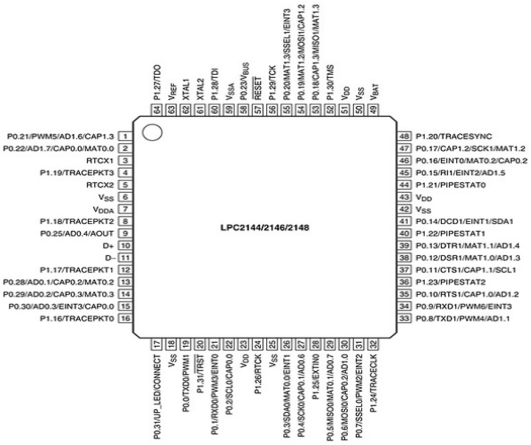


**Fig 2.5: Pin Diagram of LPC2148**

### Architectural Overview

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC).

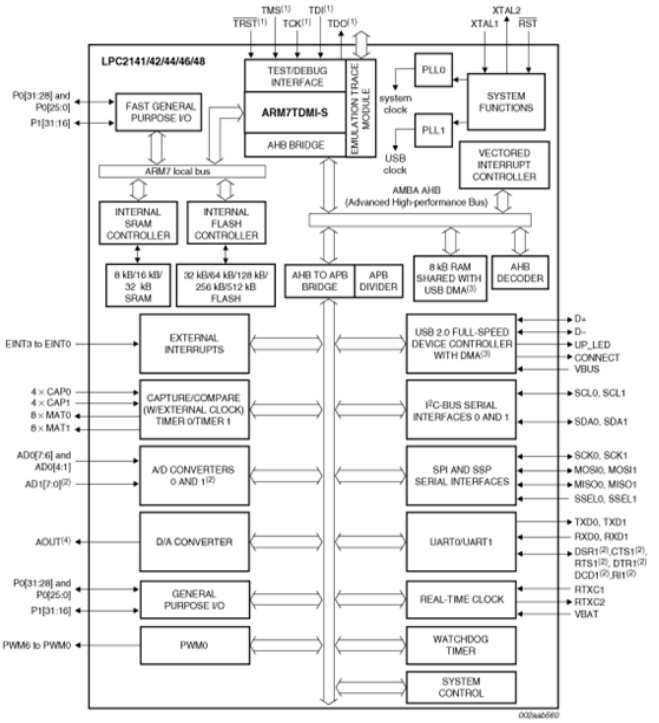


**Fig 2.6: Architecture of ARM7 LPC2148**

This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI-S processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code.

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Thumb code is able to provide up to 65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system. The particular flash implementation in the LPC2148 allows for full speed execution also in ARM mode. It is recommended to program performance critical and short code sections (such as interrupt service routines and DSP algorithms) in ARM mode. The impact on the overall code size will be minimal but the speed can be increased by 30% over Thumb mode.

### Operating modes in ARM7:

The ARM processor has several Operating Modes which are described in bellow

- ARM supports 7 modes of operation.
- ARM core modes of operation:
- User (usr): Normal program execution state
- FIQ (fiq): Data transfer state (fast irq, DMA-type transfer)
- IRQ (iqr): Used for general interrupt services
- Supervisor (svc): Protected mode for operating system support
- Abort mode (abt): Selected when data or instruction fetch is aborted
- System (sys): Operating system 'privilege'-mode for user
- Undefined (und): Selected when undefined instruction is fetched

The User Mode has limited access to the hardware (non-privileged) whereas all other modes have full access (privileged) to the CPU resources.

### ADVANTAGES:

- Low cost
- High Speed
- Reliable because of its error checking mechanism.
- Provides more safety
- Once the system is connected to the Patients we can get the readings continuously at regular intervals.
- Easy to install.

### APPLICATIONS:

- Homes
- Hospitals

### RESULTS:

The implementation of realization of "Design and Implementation of Real time Embedded Tele-Health Monitoring System" is done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements.

### PROPOSED SYSTEM RESULTS:

The main aim of this project is to continuously monitor the health condition of the patient by the doctor from his cabin by just opening the HTML page.

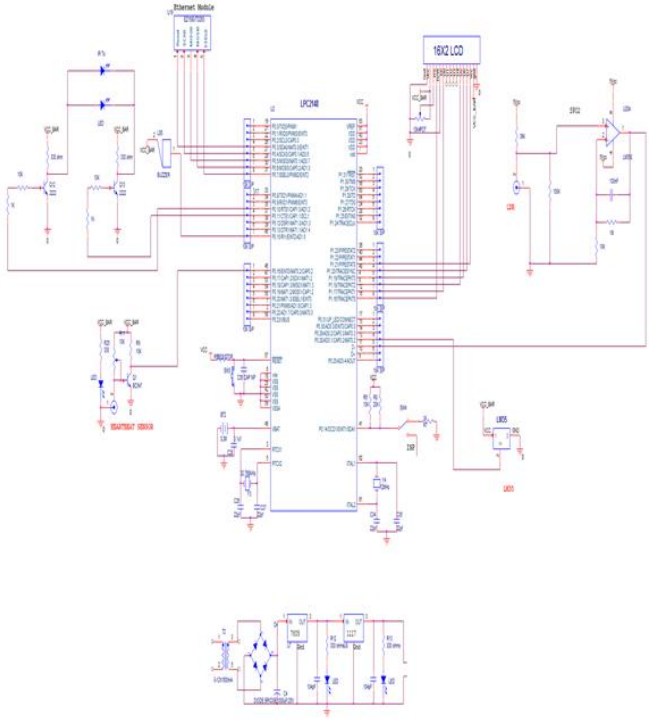

**Fig 5.1: Schematic design of proposed health monitoring system**

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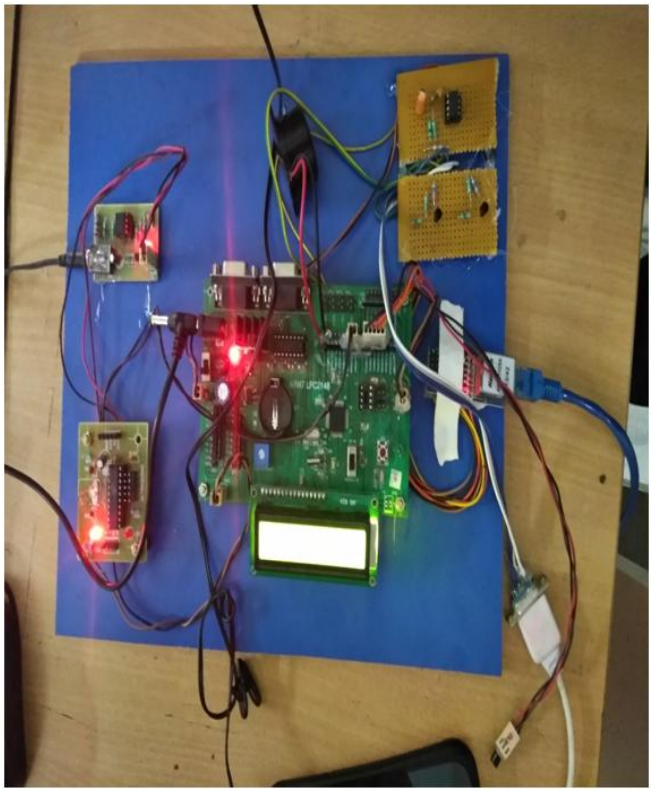

**Fig 5.2: Prototype of proposed health monitoring system**

To measure the different health parameters we are using the three sensors, body temperature sensor, heart rate and the SPO2 sensor. These sensors analog outputs are connected to the ADC channel pins of the LPC2148 microcontroller. The corresponding digital values are displayed on the LCD screen. Besides that the sensor values are sent to the HTML page. For this purpose, we are using the Ethernet module interfaced with the SPI lines of the microcontroller. The HTML page was opened by using the IP address of the Ethernet module in the web browser. By this the doctor can observe the patient condition continuously from his cabin by opening the HTML page. In this project we are using the LPC2148 microcontroller, LM35 temperature sensor, heart beat sensor, SPO2 sensor and Ethernet module. The coding was written in embedded C language and compiles using the KEIL compiler and the generated hex file was dumped into the microcontroller using the flash magic software.

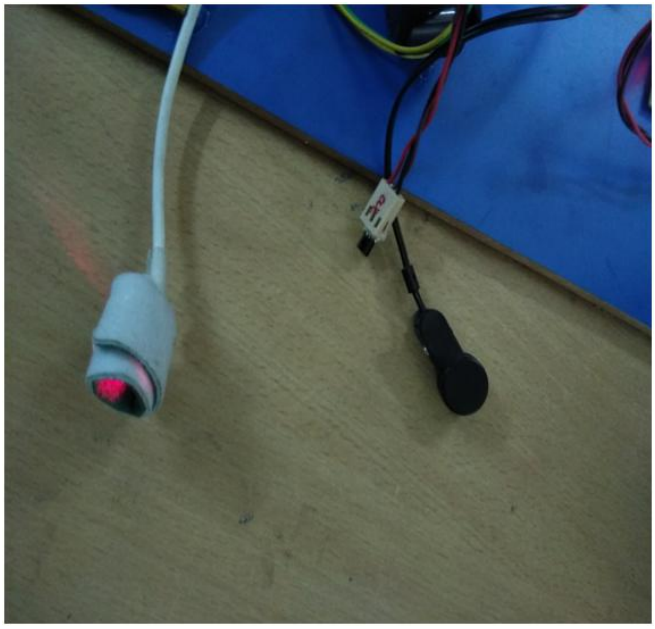

**Fig 5.3: Pulse rate, temperature and SPO2 Sensors of proposed system**

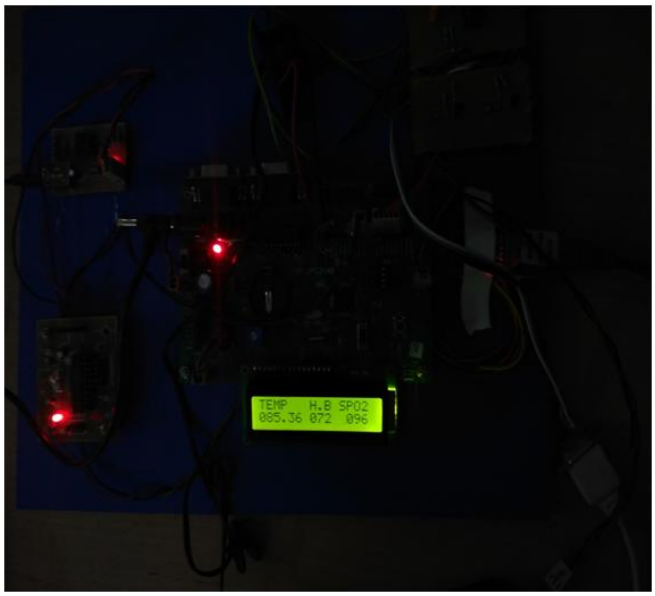


**Fig 5.4: Sensors data display of proposed system**

## CONCLUSION:

This system reduce costs by enabling in-horne monitoring of patients, eliminating the need for utilization of expensive facilities, and reducing the need for transportation of patients to physicians and medical centers. No need of man power to monitor the patients.

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We implement this work by using hardware and software in such a way so that it can be easily accessed by different systems and devices. We made the system flexible enough to accommodate more options as per user demand in future.

## FUTURE SCOPE:

In future, we will use Raspberry Pi as a core, which has in-built Wi-Fi module. By using the Wi-Fi module we can sent the sensor values to the web server. You can open this from anywhere in the world. So, we can reduce the hardware complexity in the future.

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