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Health Monitoring System Using LPC2148 Microcontroller

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Abstract: In developing countries such as India, where population and health maintenance is a major concern, new alternative solutions for health parameters are being introduced. The process of seeing a doctor for routine check-ups is a waste of time as well as a financial burden. We thereby present to you a paper on a health monitoring system that gives useful health information. It is an affordable and a portable device that measures body temperature, heart rate and blood pressure. Sensors are used to automate this tedious process. The solution will be a portable equipment that can accurately measure all of the important parameters at the same time. Temperature, blood pressure and air quality will be measured by the equipment and the results will be reflected on an LCD.

IndexTerms **- Health monitor, LM35 temperature sensor, MQ135 air quality sensor, LPC2148, Proteus Professional 8, Flash Magic.**

I. INTRODUCTION

Health care engineering applications play a pivotal role in medical advances in today's world with new inventions, innovations, and advanced levels of their implementation. Science and technology are continually evolving in today's world with new ideas, advancements and sophisticated degrees of implementation. Medical advancements rely heavily on health-care engineering applications.

Different sensors like temperature sensor, pulse rate sensor, air flow sensor, ECG sensor and glucose level detection sensor are required to monitor health of patients. As a first aid source, information presented here is used to monitor the health condition of patients at home. These days visiting hospitals and consulting doctors often are expensive and time consuming as well. For this reason, a module of the microcontroller LPC2148 is designed for monitoring a patient's health in an integrated way.

The equipment delivers a message when the parameter reaches the threshold value. When programming the LPC2148, the threshold value or cut-off is specified. The typical heart rate ranges from 20 to 120 pulses per minute, while the temperature determined by the LM35 ranges from 18 to 38 degrees Celsius. The LCD panel shows the temperature, pulse rate and air flow information.

II. RELATED WORK

Improvement of speed in data collection rate in tree based wireless sensor network: This paper, which focuses on real-time high-data-rate sensor networks, considers different levels of loads for different hops, which in turn reduces the traffic on each hop. Reducing number of time slots results in improving the data collection rate at the sink node using TDMA scheduling. [1]

An Improved Performance of Home E-health Portable Monitoring System: The methodology used here is monitoring parameters such as body temperature, heart rate, ECG, brain tumour at home before doctor's consultation. The parameters were successfully detected and information was sent through SMS to the concerned person. [2]

Patient E-health Monitoring System on ARM7-LPC2148 Microcontroller and GSM: The paper focuses on Sensing body temperature, heart rate, air flow, ECG using ARM7, microcontroller LPC2148 with GSM technology. It resulted in receiving health related data before consulting a doctor. [3]

III. OBJECTIVES AND METHODOLOGY

This notion has a lot of potential in terms of patient monitoring. Patients cannot stay in the same place for a long duration. Data is collected from patients on a daily basis using various sensors and information is provided to help them improve their health in their day-to-day activities. During the patient's recovery, the patient is monitored and assisted by the doctor. Sensors are used to perform data analysis and computing. Sensors such as the LM35, AD8232 and MQ135 aid in collecting health-related data. Electronic sensors are widely used in health-care facilities. One of the major advancements in the field of research is the use of electronic sensors to monitor patients. The system is designed to be a high-performance and advanced integrated patient monitoring system. The LPC2148 microcontroller is used to monitor the health of patients using various sensors such as heart rate, air flow and temperature. The system is integrated using a variety of sensors to collect data and monitor patient health. When each sensor is detected by an integrated system, all information is shown on an LCD. The major motivation for creating this project is to allow users to sit down at their convenience and perform a health check. It is created in such a way that it can be used and checked by anyone.

A. HARDWARE

1. Sensors

   We have used three sensors in this project namely LM35 for temperature measurement, MQ135 air quality sensor for checking the oxygen level in air and AD8232 pulse rate sensor.

   (i) LM35:

   LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of LM35 over thermistor is it does not require any external calibration. It is calibrated directly in Celsius (Centigrade) and rated for the full −55 °C to 150°C range. It operates from 4 V to 30 V.

   (ii) MQ135:

   MQ135 gas sensor can detect gasses like ammonia (NH3), sulphur (S), benzene (C6H6), carbon dioxide (CO2), and other harmful glasses and smoke. It operates at 5V and consumes around 150mA. Analog output voltage varies from 0V to 5V whereas digital output voltage varies from 0V or 5V (TTL Logic).

   (iii) AD8232:

   AD8232 is the ECG sensor module with an integrated circuit. It is useful for measuring and monitoring the electrical activity of the heart or heartbeat. AD8232 pulse rate sensor uses a 3- pole low pass filter to eliminate noise. ECGs can be extremely noisy and the AD8232 Single Lead Heart Rate Monitor acts as an op-amp to help obtain a clear signal from the PR and QT Intervals easily. Operation of single supply ranges from 2V to 3.5V.

2. LPC2148 Microcontroller board

   LPC2148 Development Board is a powerful development platform based on LPC2148 ARM7TDMI microcontroller with 512K on-chip memory. This board is powered by a USB port and does not need an external power supply. It is ideal for developing embedded applications involving high speed wireless communication (Zigbee / Bluetooth / WiFi), USB based data logging, real time data monitoring and control, interactive control panels etc. The on-chip USB controller provides direct high-speed interface to a PC/laptop with speeds up to 12Mb/s. The UART bootloader eliminates the need of an additional programmer and allows you to program using serial port. The on-board peripherals include SD/MMC card interface, USB2.0 interface, 4 Kbit I2C EEPROM, Xbee wireless module interface, ULN2003 500mA current sinking driver, L293D DC motor controller, 16X2 character LCD and many more. The on-chip peripherals and the external hardware on the development board are interconnected using pin headers and jumpers. The I/O pins on the microcontroller can be accessed from a 50-pin male header. The board is made from double sided PTH PCB board to provide extra strength to the connector joints for increased reliability.

3. RS232 cable

   RS232 is a standard protocol used for serial communication. It is used for connecting computers and its peripheral devices to allow serial data exchange between them as it obtains the voltage for the path used for the data exchange between the devices. It is used in serial communication up to 50 feet with the rate of 1.492kbps.

B. SOFTWARE

1. Proteus Professional 8

   Proteus 8 Professional is a software which can be used to draw schematics, PCB layout, code and even simulate the schematic. We have used it for the software simulation of our project.

2. Keil uVision 4 IDE

   The LPC2148 microcontroller is supported by various commercially available IDEs for compiling and debugging of the code. Keil being one of them is the widely used IDE for LPC family of microcontrollers. The µVision4 IDE is Windows-based software development platform that combines a robust editor, project manager, and make facility. µVision4 integrates all tools including the C compiler, macro assembler, linker/locator and HEX file generator.

3. Flash Magic

   The LPC series of microcontrollers are preloaded with the boot loader firmware which allows self programming of microcontrollers using serial ports known as the UART port. Flash Magic is a utility which provides an interface for reading, writing and verifying the flash memory of the microcontroller. Flash Magic is widely used for flashing the program into the microcontroller boards (LPC2148 in this case).

IV. IMPLEMENTATION

Files that contain special characters are declared. Basic stages of I/O addressing are considered. Register addressing is done using the software implementation, we use Embedded C. There are numerous source files available online that can be included. This is compatible with MPLAB IDE and numerous development tools. This development tool is compatible with platforms with UNIX, Linux, Windows, and MAC.

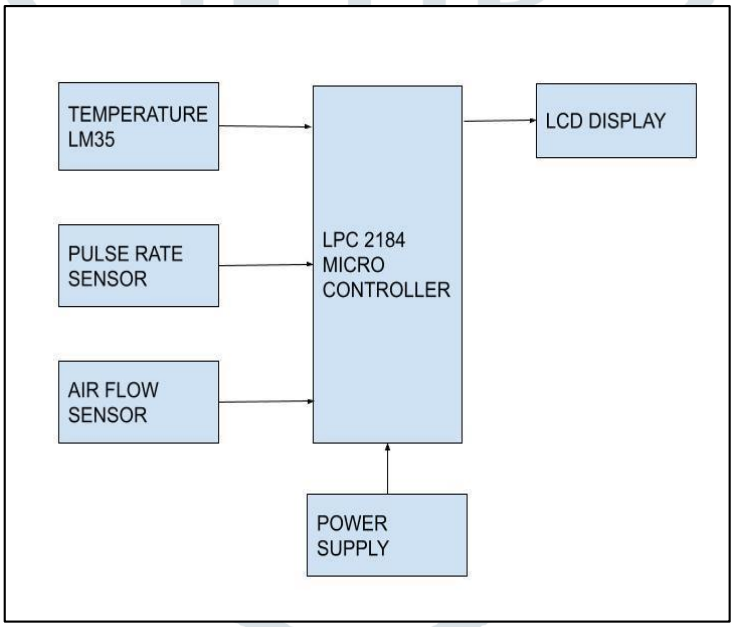

Fig. 1. Block Diagram.

V. RESULT

Data is read by the different sensors and the desired output is displayed on the LCD screen. LM-35 sensor measures temperature output in degree Celsius, AD8232 heart rate sensor detects the blood transmission on finger insertion in the detection level and MQ135 sensor detects the quality of air in ppm. When no harmful gases are present around the air quality sensor, it will give us a value of 90 ppm. Normally the safe level of air quality is 350 ppm and it should not exceed the quality level of 1000 ppm. Thus, the LCD displays a' Good air quality' result.

Fig.2.Displaying temperature output on LCD screen.

Fig.3.Displaying air quality output on LCD screen.

VI. CONCLUSION

After successfully interfacing the sensors and uploading the code on LPC2148 microcontroller board, the desired output is displayed on the LCD screen. The health monitoring system meets practical day to day life activities and promotes development of the medical system wirelessly. The concept is applicable in places like remote areas. The future scope of the project is that the abnormality of patient condition results can be sent to an authorised person/doctor using GSM technology. Further guidance can then be given by the doctors regarding the health of the patient in spite of not examining the patient themselves.

VII. REFERENCES

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