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Autonomous Wearable System for Vital Signs Measurement with Energy-Harvesting Module


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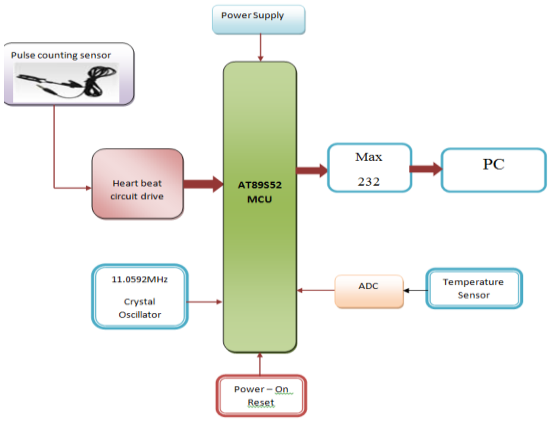
Introduction

The patient monitoring systems is one of the major improvements in the hospitality because of its advanced technology. This project is designed for convenience of patient using embedded technology. In this project simultaneously monitor the patient's condition. It is operated and available at an affordable cost. The growing demand for wearable devices is imposed by the ability to monitor in real-time critical situations in the different areas of daily life. In many cases, power is the limiting factor for such devices. One aspect is the power supply with batteries that introduces issues due to the weight, the overall dimensions, and the disposal of the batteries. A viable solution to overcome the limitations of batteries as power source is to harvest ambient energy to power the devices directly. Here we have introduced a rechargeable battery which can be carried by a patient and this can be charged using solar panel.

Existing method

This instrument employs a simple Opto electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. The Pulse monitor works both on battery or mains supply. It is ideal for continuous monitoring in operation theatres, I.C.units, biomedical/human engineering studies and sports medicine. This project uses AT89S52 MCU as its controller. By reading pulse values continuously from pulse count sensor placed to the fore finger of patient these values are displayed on PC. Here we are using temperature sensor to have temperature values on PC for that we will be using ADC.

Block diagram



Draw backs

No wireless communication is involved.

Proposed method:

Low power sensor node design has become an important research topic since the measurement of physical quantities became very attractive to the industry, especially for medical applications that implement the concept of Wireless Body Area Networks (WBAN). This project describes the design

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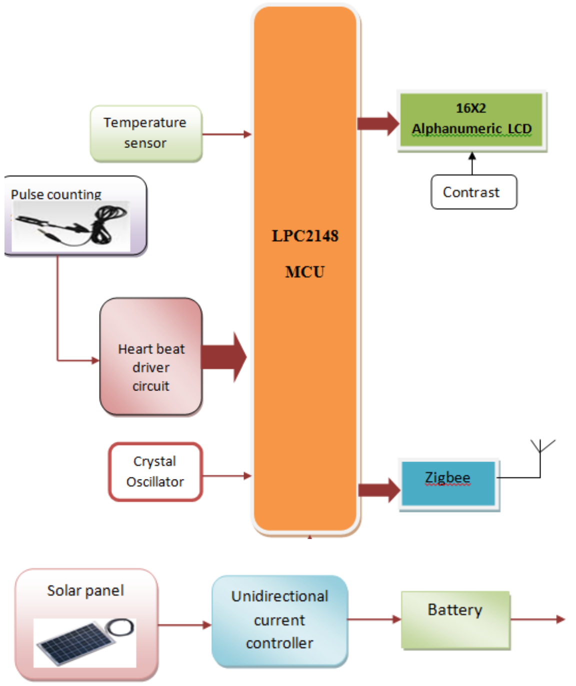
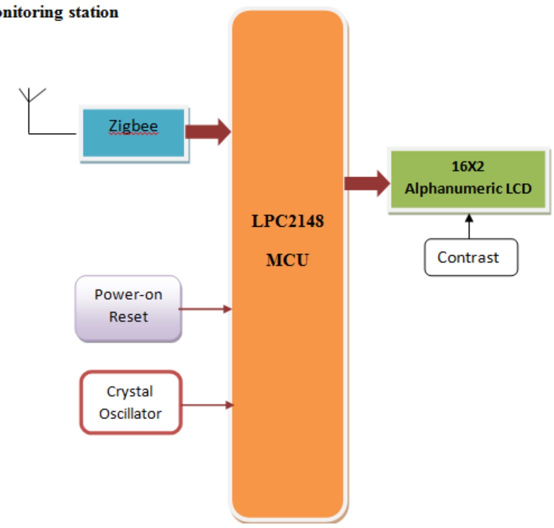
of a simple, low-cost controller based patient health monitoring system. Heart rate of the subject is measured from the thumb finger using IRD (Infra Red Device sensors). This instrument employs a simple Opto electronic sensor, conveniently strapped on the finger, to give continuous indication of the pulse digits. A temperature sensor is included to know the patient's temperature. This project uses as its controller LPC2148. Here we are monitoring patients condition and then sent to the monitoring station using Zigbee communication.

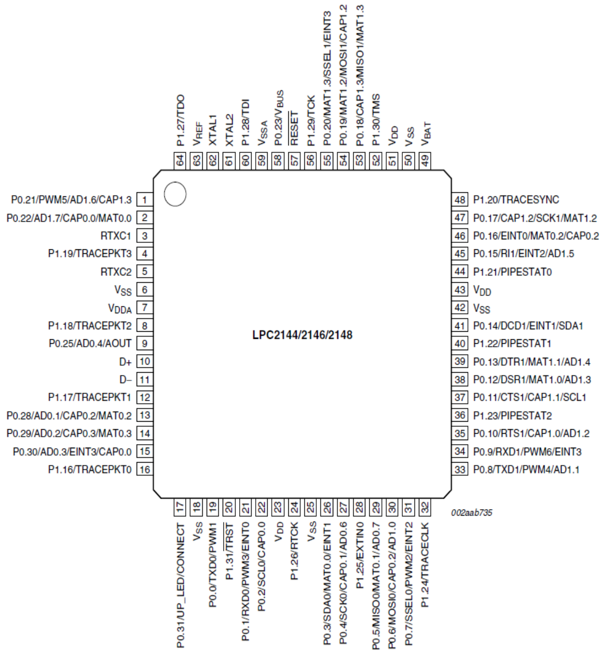


Monitoring station



Modules used in this project

LPC2148



ARM7TDMI Processor Core

- Current low-end ARM core for applications like digital mobile phones
- TDMI
  - T: Thumb, 16-bit compressed instruction set
  - D: on-chip Debug support, enabling the processor to halt in response to a debug request
  - M: enhanced Multiplier, yield a full 64-bit result, high performance
  - I: Embedded ICE hardware

Von Neumann architecture

Pulse counting sensor

Heart rate is the speed of people's emotional state, exercise intensity and objective indicator of cardiac function. But most people are very difficult to accurately measure the time and his heart rate values. If the heart rate monitor with me, heart ECG electrodes will be detected by monitoring the signal processing device, the user can at any time that your heart rate changes, changes in heart rate, self-monitoring status.

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Heart rate monitor for heart rate range (60 ~ 160) / min. Circuit by adjusting the relevant components, in the (60 ~ 160) / min within the audible alarm can change the heart rate range. This heart rate range the width of the design center values ± 20% range. If central values such as emphasis on the 100 / exceptionally, the heart rate signal range (80 ~ 120) / min, if the heart rate exceeds this range, the lower limit, the instrument does not sound, if the heart rate in the range of the instrument ECG is the sound issue.

LM35

FEATURES DESCRIPTION

- Calibrated Directly in ° Celsius (Centigrade)
- Linear + 10 mV/°C Scale Factor
- 0.5°C Ensured Accuracy (at +25°C)
- Rated for Full −55°C to +150°C Range
- Suitable for Remote Applications
- Low Cost Due to Wafer-Level Trimming
- Operates from 4 to 30 V
- Less than 60-µA Current Drain
- Low Self-Heating, 0.08°C in Still Air
- Nonlinearity Only ±¼°C Typical
- Low Impedance Output, 0.1 Ω for 1 mA Load

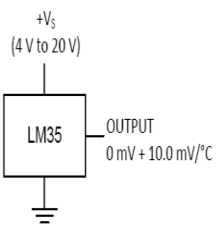

Figure 1. Basic Centigrade Temperature Sensor (+2°C to +150°C)

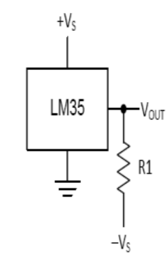

Figure 2. Full-Range Centigrade Temperature Sensor

Advantages:

- Ease of operation
- Low maintenance cost
- Fit and forget system
- No wastage of time
- Durability
- Accuracy

Applications:

- Hospitals
- Remote heart rate monitoring applications
- Body temperature Monitoring
- Local monitoring applications
- Designed for Home and Clinical Applications

Future scope

Video monitoring could be used for monitoring patients

CONCLUSION

The instrumented T-shirt has been designed, built, and tested, and thus, the description of each block and the adopted methodological choices have been reported. The experimental results show the possibility of use the

T-shirt outdoors in sunny and shadow areas and then in two indoor cases, but with specific constraints. These last two cases, although limited to particular conditions, can be the starting point for an adoption even indoors.

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