

Development of Wireless Portable Integrated Cardio-Pulmonary Device

V. Prasanth, Abishek J, K. Nethajhi, Shase Dharan

Dept. of computer science and engineering, Velammal Institute of technology, Chennai

Abstract: In this project, we are designing a prototype model of a low cost wireless portable and integrated cardio-pulmonary device. The design of the device will be such that it integrates the various emergency cardio and pulmonary functions that are required to save a person's life during an emergency. The prototype model involves the integration of two basic cardio-pulmonary devices such as Electrocardiograph (ECG) and Pulse-Oximeter. The design can be later expanded to include other cardio-pulmonary devices into it.

Pulse Oximeter is a cardio pulmonary device which measures the blood oxygen saturation. The Electrocardiograph is a device which measures the rate and regularity of heart beats, size and position of chambers, damage to the heart and the effects of any drug on the heart. The integrated device will be connected to a wireless internet so doctors can control the device from the hospital as well data can be received from the device. This will help in reducing the delay taken to provide treatment to the patient as delay required to obtain information about the patient is minimized. The device tries to reduce the cost by using a laptop as the screen using a common processor board which is capable of doing all the functions instead of having an individual board for each function.

Key Words- Electrocardiograph, Pulse Oximeter, Wireless network, GSM

I. Introduction

In rural India, the ability of proper medical and health care has been a cause of worry since independence. The main reason for this problem is the lack of infrastructure required in the villages. The main reason for this the lack of funds and resources available with the government of India in order to setup the infrastructure required for setting up the healthcare facility in rural India. The solution for the above problem is to develop a healthcare system for rural India which requires very low investment and infrastructure requirements. It is in this situation that our wireless portable integrated cardio-pulmonary device comes into use. Our system requires very low investment and maintenance costs. This enables quicker and easier implementation of healthcare facilities to rural India on a large scale.

II. Existing System

In the system of healthcare that is currently provided to the citizens of rural India, the medical devices used are heavy, difficult to maintain and require a heavy amount of investment and infrastructure. The government of a developing country like India finds it difficult to invest such large amounts of investment in providing healthcare to people of rural India. As a result of which the people residing in Indian villages are denied proper health care facilities.

III. Proposed System

A. The Cardio- Pulmonary Device

The cardio-pulmonary device proposed by us consists of multiple cardio as well as pulmonary devices built into a single device. This helps in making the various devices portable as they are integrated into a single

portable device. We initially have integrated two devices into the device. The devices which we have initially decided to integrate are Electrocardiogram (ECG) and pulse oximeter. More cardio pulmonary devices can be combined in future in-order to expand the cardio-pulmonary device proposed by us.

B. The Wireless Transmission

The proposed system integrates more than one cardio-pulmonary device into a single device. The system transmits the data to the doctor present in a remote location via GSM technology. GSM technology is used due to the large scale implementation of cell phone and GSM technology in India. This project is helping to provide healthcare facilities in rural India. The system also falls under Tele-medicine where there is no requirement of patient to visit the hospital for regular check-ups.

C. Working Principle

Our cardio-pulmonary device consists of 3 main modules:

The first module comprises of the pulse oximeter. Pulse Oximeter is a cardio pulmonary device which measures the blood oxygen saturation. The second module comprises of the Electrocardiograph. The Electrocardiograph is a device which measures the rate and regularity of heart beats, size and position of chambers, damage to the heart and the effects of any drug on the heart. The third module comprises of the GSM module as well as the integration part. The integrated device will be connected to a wireless internet so doctors can control the device from the hospital as well data can be received from the device. This will help in reducing the delay taken to provide treatment to the patient as delay required to obtain information about the patient is minimized. The device tries to reduce the cost by using a laptop as the screen, using a common processor board which is capable of doing all the functions instead of having an individual board for each function.

D. ECG and Pulse Oximeter Sensor Module

The sensor module we are using for the detection of the ECG signal as well as the pulse is Sunrom Technologies model# 1181. It is a thumb pad based ECG Sensor. The oxygen content of the blood is calculated using the width of the pulse signals detected by the sensor module.

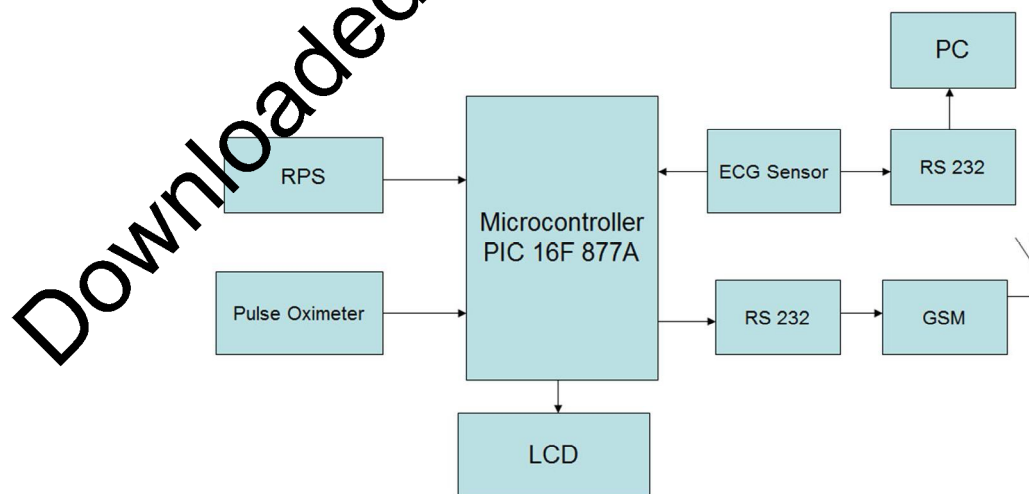


Fig 1. Block diagram of the proposed system

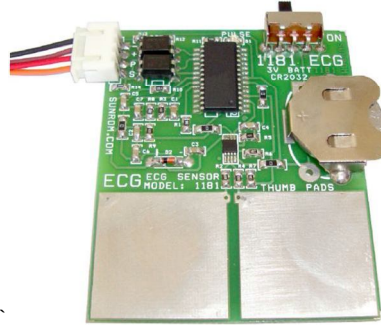


Fig 2. ECG sensor module

E. Advantages of the System to the Village People

- Provides better medical and health care facility to people living in the village
- The data can be sent via internet to doctors present in urban areas thereby receiving better medical advice.
- Villagers can be trained to use the device easily thereby providing more employment to people living in the village.

F. Advantages of the System to the Government

- Easier to implement on a large scale
- Does not require large amount of technical cost to maintain the system
- Easy to transport and setup in an area
- It can also be used in crowded areas where setting up of full-fledged healthcare facility is difficult

IV. Hardware Setup and Experimental Results

The hardware setup of the cardio pulmonary device is given in fig 3. The experimental result of the system is given in Fig 4.

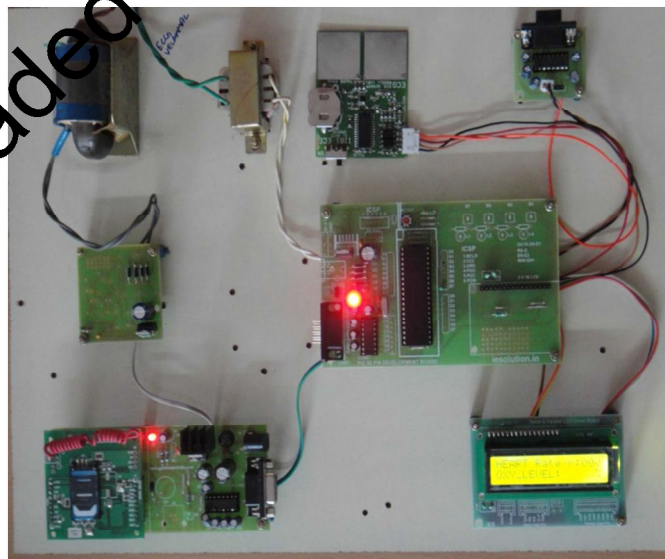


Fig 3. The hardware model

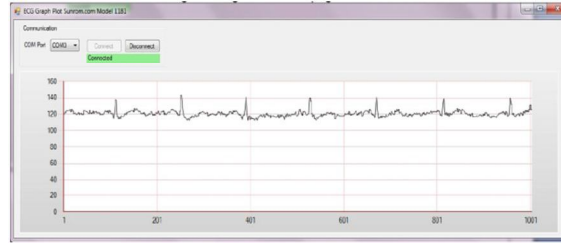


Fig 4. The Experimental ECG signal

V. Conclusion

We conclude by saying that by implementing our project on a large scale, better medical facilities can be provided to rural India with lower expenditure as well as infrastructure requirements.

Reference

1. Advanced Pulse Oximetry System for Remote Monitoring and Management, Ju Geon Pak and Kee Hyun Park, Published June 2012
2. "A novel setup for automatic measurement of ECG signals parameters." International Conference on CONTROL. Held: Coventry, UK, 21-24 March 1994. (UK: IEE, 1994. p. 18-23 vol.1) (Conference paper - English) ISBN 0-85296-610-5
3. "Automatic detection of wave boundaries in multilead ECG signals: validation with the CSE database." COMPUTERS AND BIOMEDICAL RESEARCH (Feb. 1994) vol.27, no.1, p. 45-60. (Journal article - English) ISSN 0010-4809
4. "A new method for the simultaneous automatic measurement of the RR and QT intervals in ambulatory ECG recordings." PROCEEDINGS OF COMPUTER IN CARDIOLOGY 1992 (CAT. NO.92CH3259-9). Held: Durham, NC, USA, 11-14 Oct. 1992. (USA: IEEE Comput. Soc. Press, 1992. p. 171-4) (Conference paper - English) ISBN 0-8186-3552-5