

An Ubiquitous Way of Health Care Monitoring System using Android Mobile Phone

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Abstract

Provision of ubiquitous healthcare solutions which provide healthcare services at anytime anywhere has become more favorable nowadays due to the emphasis on healthcare awareness and also the growth of mobile wireless technologies. Following this approach, an Android™ smart phone device is proposed as a mobile monitoring terminal to observe and analyze ECG (electrocardiography) waveforms, BP, Body Temperature from sensor devices in real time.

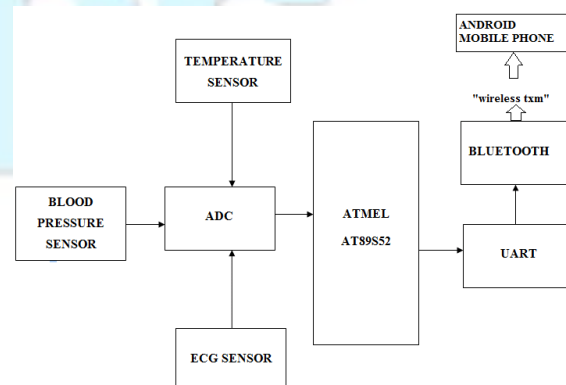
Index Terms – personal healthcare, ECG monitoring, blood pressure, temperature, android smart phone, etc.

I. INTRODUCTION

Chronic diseases are recognized as the leading cause of mortality in the World. According to statistics, among the top 10 leading causes of death in 2009 in South Korea, eight are chronic diseases. Having experienced the loss of a beloved one due to a chronic disease such as heart diseases, hypertensive diseases and diabetes, people are now becoming more conscious about healthcare. Long term and quality medication treatment is necessary for chronic disease patients to ensure the disease is under control as chronic diseases are long-lasting and recurrent. Thus, the overall global healthcare costs are exploding as the public's demand for better quality of healthcare increases. The consequence of this growing demand is a shortage of medical professionals and suitable medical infrastructures. Therefore, radical changes are needed to solve the problem.

Previously, healthcare was focused on institutional care and on curing diseases, which is diagnosis-based treatment only. Patients only approach medical professionals when they are not feeling well. However, constant monitoring, early detection and management of chronic diseases are important to avoid the occurrence of complications and risks. If the healthcare monitoring and management process moves from clinical-centric to patient-centric, be done at residential area by the patient him/herself, it would be a great solution to the resource shortage problems in hospitals. This will also greatly improve the patient's medical knowledge as well as make one more alert to one self's health status and this paper deals with those things and its working , features , feasibility , advantages are described in following topics.

II. BLOCK DIAGRAM



III. TECHNICAL

This project deals with sensor – controller interface and its output can be viewed in an android mobile

phone. As per the circuit diagram, this project can be split into various modules such as

1. Sensors module,
2. ADC module,
3. Controller module,
4. UART module,
5. Bluetooth device.

1. SENSORS MODULE

Here, we are using three sensors namely,

- ECG Sensor,
- Blood Pressure Sensor,
- Temperature Sensor.

ECG SENSOR



Description:

- Vin: 5V.
- Vout: Analog voltage.
- Iout: 50ma.
- Uses three electrodes.
- Difference in voltage between two arms is taken.
- Right leg electrode serves as the reference.

It consists of,

- Three electrodes,
- Differential amplifier,
- Filter.

The purpose of this project is to create a portable Electrocardiogram (ECG) to monitor patients who are in their houses or employees with risk of heart attack.

The context for this project is the integration of wireless communication in medical applications for home healthcare. This means that, patients are no longer bound to a specific healthcare location where they are monitored by medical instruments. Wireless Communication will not only provide them with safe and accurate monitoring, but also the freedom of movement.

This portable ECG will monitor the patients with 3 electrodes that will measure the body information. Then an electronic circuit will amplify this data and filter it to enhance the signal/noise ratio. After that the information will be saved in a database and the data is then sent through wireless communication to a monitoring system, where the data is analyzed, and if it is out of health limits a message is sent to notify the doctor.

Cardiac signals from the heart are extremely weak (in the range of 0.025-4mV with frequencies between 0.05 and 100 Hz) and are often very noisy, since it is hard to get a good contact between an electrode and the skin. For that reason, an ECG amplifier circuit is needed to amplify the signal and reduce the present noise.

BLOOD PRESSURE SENSOR



Pin Description:

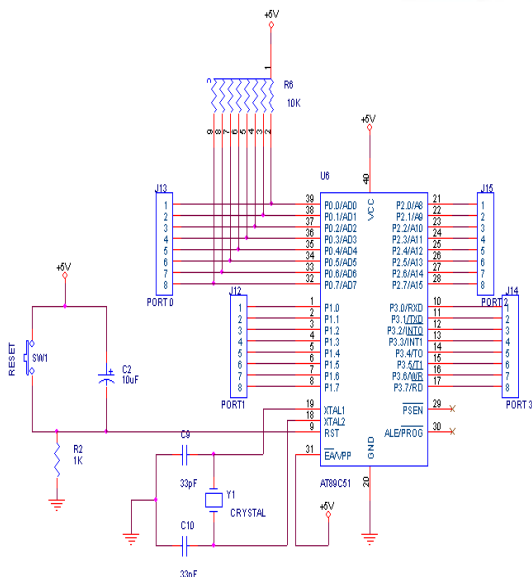
Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
gnd	+vout	Vs	-vout	nc	nc	nc	nc

Description:

- 2.5% Maximum Error over 0° to 85°C
- Temperature Compensated from Over -40° to +125°C
- Patented Silicon Shear Stress Strain Gauge

The controller here used is Atmel 89S52 and its features are described below:

- The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory.
- 4.0V to 5.5V Operating Range.
- Fully Static Operation: 0 Hz to 33 MHz.
- 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.
- supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning.
- The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.



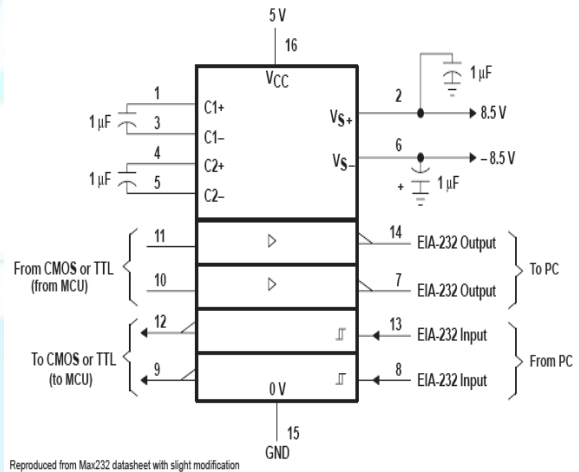
4. UART MODULE

- A universal asynchronous receiver/transmitter is a type of "asynchronous receiver/transmitter", a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with other communication standards such as EIA RS-232.
- The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications.
- The UART takes bytes of data and transmits the individual bits in a sequential fashion.

It uses two main components namely,

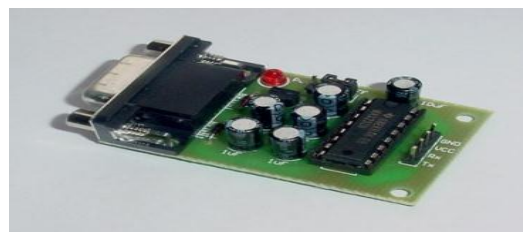
- RS232,
- MAX 232.

MAX 232 DIAGRAM:



Reproduced from Max232 datasheet with slight modification

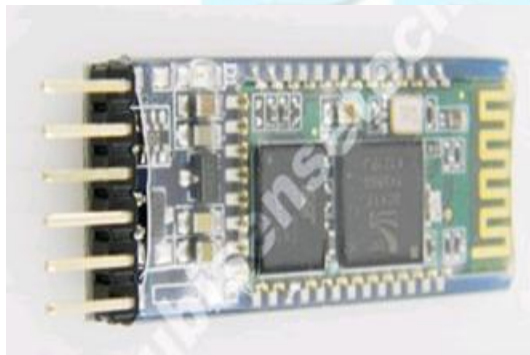
UART BOARD:



5. BLUETOOTH DEVICE MODULE

- It provides agreement at the physical level -- Bluetooth is a radio-frequency standard.
- Bluetooth is a standard for a small , cheap radio chip to be plugged into computers, printers, mobile phones, etc
- Bluetooth chip is designed to replace cables. Information normally carried by the cable, is transmitted at a special frequency to a receiver Bluetooth chip.
- These devices can form a quick ad-hoc secure “*piconet*” and start communication.
- Connections in the “*piconets*” can occur even when mobile
- Secure as cables – must support authentication and encryption
- Must support both data and voice.
- Must connect to a variety of devices.
- Must be able to function in a noisy environment.
- Data rates – 721kbps , using the 2.45Ghz radio frequency band –I.S.M (Industrial, scientific and medical)
- Must support many simultaneous and private “*piconets*”.
- Must be low power, compact and global.
- The Radio (layer) is the lowest defined layer of the Bluetooth specification.
- It defines the requirements of the Bluetooth transceiver device operating in the 2.4GHz ISM band
- The Bluetooth device used here having six pins in which three pins are used and they are connected to RS232 cable from microcontroller through MAX232.
- The BT device used here is low cost.

CIRCUIT BOARD OF BT DEVICE



6. ANDROID MOBILE PHONE

Here the output can be viewed using an android mobile phone by creating a suitable application in java software platform for android phone.

From the Bluetooth device, the signal can be received by any Bluetooth enabled android mobile phone and it can be further mailed to doctor and also we can keep the copy in memory card too.

OUTPUT:



IV. ADVANTAGES

- Low cost
- We can add many sensors as possible and depends upon our needs
- Easy to use
- User friendly
- Ambulatory purposes
- Can be used in houses, clinics, hospitals , etc.
- No special care is needed for patients.

V. REFERENCES

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- A ZigBee-based ECG transmission for a low cost solution in home care services delivery F. Vergari, V. Auteri, C. Corsi, C. Lamberti