PERSONAL HEALTH MONITORING WITH ANDROID BASED MOBILE DEVICES

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ABSTRACT: Patient monitoring systems are gaining their importance as the fast-growing global elderly population increases demands for caretaking. These systems use wireless technologies to transmit vital signs for medical evaluation. The aim of the project is to provide a better health care to people from house in more economic and pertinent friendly manner. The need of home based health monitoring system is increased now days because health care cost is increasing exponentially in last few decades. In the proposed home based health monitoring system using android smart phone includes the aspects of acquisition of medical parameters like Body temperature, Pulse rate and ECG. Processing of a collected data using ARM7 (LPC2148) processer and processed data is then displayed on doctors or relatives android mobile phones. Also the data can be displayed on personal computer. The system is utilizing a low cost component to transmit data like ECG to physician for monitoring; diagnosis and patients care at significantly low cost, regardless of patient's location.

KEY WORDS- medical evaluation, android smart phone, aspects of acquisition, ECG, ARM7 (LPC2148), Diagnosis

INTRODUCTION:

In intensive care units, there are provisions for continuously monitoring patients. Their heart rates, temperatures, ECG etc. are continuously monitored. But in many cases, patients get well and come back to home from hospital. But the disease may return, he may get infected with a new Disease, there may be a sudden attack that may cause his death. So in many cases, patients are released from hospital but still they are strongly advised to be under rest and observation for some period of time (from several days to several months). In these cases, our system can be quite handy. Patient's data (temperature, heart rate, ECG etc.) will be frequently measured and sent to server. Period of sending (say every 3 min) can be set. Heart rates can be sent every minute and temperatures can be sent after half an hour etc. But these can be parameterized to ensure that when a patient is

normal, not many readings will be sent so that sensors have a longer life-time. But when the patient is ill, readings will be taken frequently and sent to server.

Monitoring person learns patient specific threshold. Say the regular body temperature of a patient is 37 c whereas one person feels feverish if his body temperature is 37.0 c. By employing an averaging technique over a relatively long time, Observer can learn these thresholds for patients. Using android application, one can view his medical history date wise, event wise etc. android application can perform data mining on a particular patient data to discover important facts. Suppose a person has medium high temperature that starts at evening and lasts till midnight. If this phenomenon continues for several days, observer can detect this fact and inform to doctors saying "You frequently have short-period fever that may be a symptom of a bad disease. Consult patient immediately". This system can transmit continuously data. Suppose a patient has come back home after cardiac surgery. If the patient has cardiac problems like

arrhythmia, then there will be irregular variation of heart signal. This may occur only once or twice a day. But if system transmits continuous data, such variations will be immediately detected and alerts will be issued.

I. HARDWARE SYSTEM:

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.
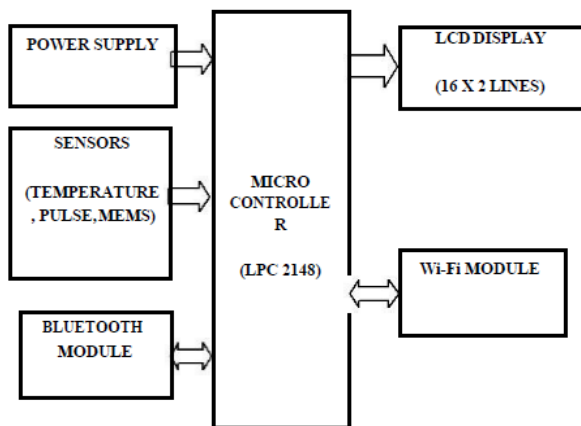

Fig: Block diagram

II. Board hardware system features:
Temperature sensor:

A thermistor is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as inrush current limiter, temperature sensors (NTC type typically), self-resetting overcurrent protectors, and self-regulating heating elements. The TMP103 is a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP). The TMP103 is capable of reading temperatures to a resolution of 1°C.

Fig: Temperature sensor

MEMS:
Micro-Electro-Mechanical Systems (MEMS) is the integration ofmechanical elements,

sensors, actuators, and electronics on a common silicon substrate through microfabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices. MEMS promises to revolutionize nearly every product category by bringing together silicon-based microelectronicswith

micromachining technology, making possible the realization of complete systems-on-a-chip. MEMS is an enabling technology allowing the development of smart products, augmenting the computational ability of microelectronics with the perception and control capabilities of micro sensors and micro actuators and expanding the space of possible designs and applications.

Microelectronic integrated circuits can be thought of as the "brains" of a system and MEMS augments this decision-making capability with "eyes" and "arms", to allow

micro systems to sense and control the environment. Sensors gather information from the environment through measuring mechanical, thermal, biological, chemical, optical, and magnetic phenomena. The electronics then process the information derived from the sensors and through some decision making capability direct the actuators to respond by moving, positioning, regulating, pumping, and filtering, thereby controlling the environment for some desired outcome or purpose. Because MEMS devices are manufactured using batch fabrication techniques similar to those used for integrated circuits, unprecedented levels of functionality, reliability, and sophistication can be placed on a small silicon chip at a relatively low cost.
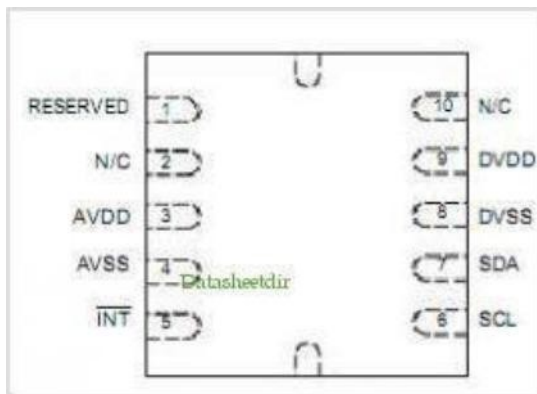

Fig: MEMS IC

Bluetooth technology was discovered to have wireless protocols to connect several electronic devices and as a solution to synchronize the data. The MAX232 converts from RS232 voltage levels to TTL voltage levels, and vice versa. One advantage of the MAX232 chip is that it uses a +5V power source which, is the same as the source voltage for the 8051. In the other words, with a single +5V power supply we can power both the 8051 and MAX232, with no need for the power supplies. The MAX232 has two sets of line drivers for transferring and receiving data. The line drivers used for TXD are called T1 and T2, while the line drivers for RXD are designated as R1 and R2. In many applications only one of each is used.
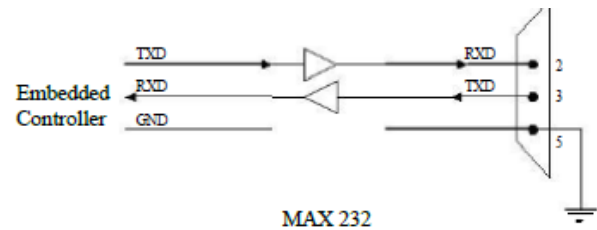

Fig: Communication via Max 232

Pulse sensor:

Attach to finger and get Analog out from the

sensor based on heart beat pulse. You can read the analog output with microcontroller ADC and then plot it or calculate readings like heart beat per minute. Simple to use and accurate results.

Bluetooth:

Bluetooth is a wireless technology used to transfer data between different electronic devices. The distance of data transmission is small in comparison to other modes of wireless communication. This technology eradicates the use of cords, cables, adapters and permits the electronic devices to communicate wirelessly among each other.

The key features of Bluetooth technology:
• Less complication
• Less power consumption
• Available at cheaper rates
• Robustness

Bluetooth technology was discovered to have wireless protocols to connect several electronic devices and as a solution to synchronize the data. The Bluetooth standard is maintained by the Bluetooth Special Interest Group.

At the physical layer, the Bluetooth RF transceiver is positioned. At around 79 Bluetooth channels are placed with a space of 1MHz. Transmission of data and voice are achievable at short distances and thereby creating Wireless PANs.

A Bluetooth device is comprised of an adapter. A Bluetooth adapter can be available in the form

of a card to connect the device or integrated into an electronic device.

Link Management Protocol (LMP) is responsible for peer – to – peer message exchange when the electronic devices interfere in each other's radio range. This layer creates the link and negotiation of packet size. If required this layer can perform the segmentation and reassembling of the packets.

The Bluetooth device enabled by the Service delivery protocol joins the piconet and enquires with all the services available. A piconet has a star topology with one master and seven slaves. The concept of Master and Slave is used in the Bluetooth technology. Only after the master takes the initial action, the devices can begin to talk. Bluetooth GloballD is exchanged among the electronic devices and a connection is build up after the profiles are matched. Get in-depth of Bluetooth Protocol Stack here.

Frequency hopping is used in the Bluetooth technology to avoid interfering with other signals. After the packet is transmitted or received, the Bluetooth signal hops to a new frequency. Each packet can cover five time slots.

The Bluetooth technology supports asynchronous data channel, or 3 simultaneous synchronous voice channels, or a channel which supports asynchronous data and synchronous voice.

Fig: Bluetooth Module
WIFI:

Wi-Fi is the name of a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections. A common misconception is that the term Wi-Fi is short for "wireless fidelity," however this is not the case. Wi-Fi is simply a trademarked phrase that means IEEE 802.11x. Wi-Fi works with no physical wired connection between sender and receiver by using radio frequency (RF) technology, a frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space.

The cornerstone of any wireless network is an access point (AP). The primary job of an access point is to broadcast a wireless signal that computers can detect and "tune" into. In order to connect to an access point and join a wireless network, computers and devices must be equipped with wireless network adapters Wi- Fi is supported by many applications and devices including video game consoles, home networks, PDAs, mobile phones, major operating systems, and other types of consumer electronics. Any products that are tested and approved as "Wi-Fi Certified" (a registered trademark) by the Wi-Fi Alliance are certified as interoperable with each other, even if they are from different manufacturers. For example, a user with a Wi-Fi Certified product can use any brand of access point with any other brand of client hardware that also is also "Wi-Fi Certified". Products that pass this certification are required to carry an identifying seal on their packaging that states "Wi-Fi Certified" and indicates the radio frequency band used (2.5GHz for 802.11b, 802.11g, or 802.11n, and 5GHz for 802.11a).

Fig: WIFI Module

VSD03 is the new third-generation embedded Uart- Wifi modules studied by VSD TECH. Uart-Wif is an embedded module based on the Uart serial,according with the WiFi wireless WLAN standards, It accords with IEEE802.11 protocol stack and TCP / IP protocol stack，and it enables the data conversion between the user serial and the wireless network module. through the Uart-Wifi module, the traditional serial devices can easily access to the wireless network. VSD03 does a comprehensive

hardware and software upgrades based on the products

its main features include: Interface:

- ☐ 2*4 pins of Interface: HDR254M-2X4
- ☐ The range of baud rate: 1200~115200bps
- ☐ RTS / CTS Hardware flow control
- ☐ single 3.3V power supply Wireless
- ☐ support IEEE802.11b / g wireless standards
- ☐ support the range of frequency: 2.412~2.484 GHz
- ☐ support two types of wireless networks:
  - o Ad hoc and Infrastructure
- ☐ support multiple security authentication mechanisms:
  - o WEP64/WEP128/ TKIP/CCMP(AES)
  - o WEP/WPA-PSK/WPA2-PSK
- ☐ support quick networking
- ☐ support wireless roam

IV. CONCLUSION:

This system reduce costs by enabling in home monitoring of patients, eliminating the need for utilization of expensive facilities, and reducing the need for transportation of patients to physicians and Medical centers.

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