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Mems Based Hand Gesture Recognition of Physically Disabled People

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Abstract: *Now days it is very complicated to monitor patients health every hour. This is very helpful and useful for monitoring more number of people at a time. It was very low cost and effective. In this project microcontroller consists of GSM modem and analog, digital sensors and MEMS. With the help of sensors microcontroller detects patient's health parameters like Temperature, Heart beatetc., here we use ADC0804/08 for analog sensors, and digital sensors are connected directly to I/O ports of microcontroller. Microcontroller takes the information of sensors and sends the data through GSM. MEMS is used to indicate the emergency conditions by patients like left and right movements. An automatic gesture recognition algorithm is developed to identify individual gestures in a sequence. As a final point, the gesture is recognized by comparing the acceleration values with the stored templates. According to recognized gesture, respective commands displayed on LCD*

Keywords— GSM, Sensors, MEMS, Buzzer, LCD Display.

I. INTRODUCTION

An embedded system is an electronic or electromechanical system designed to perform a specific function and is the combination of both hardware and software. It is a system which is a combination of special purpose hardware and embedded operating system for executing a specific set of applications. It may or may not contain an operating system to function. If the embedded system does the work in a specific time then it is called as real time embedded system. Embedded system is classified based on generation, based on deterministic, and based on triggering, based on complexity and performance requirements. The main purpose of embedded system is Data Collection/storage/representation, Data Communication, monitoring, control, Application specific user interface, Data processing. We have different Applications of Embedded systems such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. Each of these appliances will have a processor and special hardware to operate the requirement of the application also with the embedded software that is executed by the processor to meet that specific requirement. The embedded software is also called "firm ware". Embedded systems performs specific task, they cannot be programmed to do different applications. Embedded systems have limited memory. Generally, they don't have secondary devices like CDROM or a floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded systems, called real-time systems, if deadline is crossed it results the loss of life. As many embedded systems operate through a battery, the power consumption has to be very low. Some embedded systems can operate in extreme environmental conditions such as very high temperature and humidity. A microprocessor is a computer processor which incorporates the function of a computers central processing unit on a single IC. Microprocessors contain both combinational logic and sequential logic.

A. Types of Microprocessors

1) Digital Signal Processors:

- a) For signal processing applications
- b) Low cost and high speed

2) Microcontrollers:

- a) For control applications
- b) Low cost and flexible I/O configuration

3) General purpose processors:

- a) For general purpose computers
- b) High speed

DSP chips are designed for digital processing or motor feedback control applications. Mostly these applications require high speed real time dot product calculations and matrix manipulations.

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Microcontrollers are designed for control applications.

General purpose processors are designed for PCs and workstations. These are low cost than that of DSPs and microcontrollers. As the application of a PC or a workstation cannot be determined, the speed for all kinds of computations should be fast.

B. ARM-7



ARM microcontroller means Advanced Risc Machine .It is one of the extensive processor in the world. The first ARM processor was developed in the year 1978 and the first ARM RISC processor was produced by the Acorn Group of Computers. These processors are mainly used in portable devices like digital cameras, mobile phones, home networking modules and wireless communication technologies and other embedded system projects , such as low power consumption, performance, etc.

C. ARM7 LPC2148 Features

- 1) It is a 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 2) RAM size of ARM is from 8 to 40 kB and ROM size of 32 to 512 kB. 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- 3) In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. It has Single flash or full chip erase in 400 ms and programming of 256 bytes in 1 ms.
- 4) USB 2.0 Full Speed compliant Device Controller with 2 kB of endpoint RAMS. In addition, the LPC2146/8 provide 8 kB of on-chip RAM accessible to USB by DMA.
- 5) One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provides with conversion time as low as 2.44 s per channel.
- 6) Single 10-bit D/A converter provide variable analog output.
- 7) Two 32-bit timers are present in ARM where as in 8051 we have 16 bit timers, PWM unit (six outputs) and watchdog.
- 8) Low power real-time clock with independent power and dedicated 32 kHz clock input.

D. MEMS Micro Electro Mechanical Systems

MEMS means Micro Electro Mechanical Systems are small integrated devices which combine electrical and mechanical components. The range from the sub micrometer (or sub micron) level to the millimeter level and there can be any number, from a few to millions, in a system. MEMS have extended the fabrication techniques developed for the integrated circuit to add mechanical elements such as gears, diaphragms and springs to devices.

Examples of MEMS devices are accelerometers, miniature robots, micro-engines, locks, inertial sensors, micro transmissions, micro actuators, optical scanners, transducers and chemical pressure and flow sensors. Most of the applications are emerging as the existing technology which is applied to the integration of conventional devices.

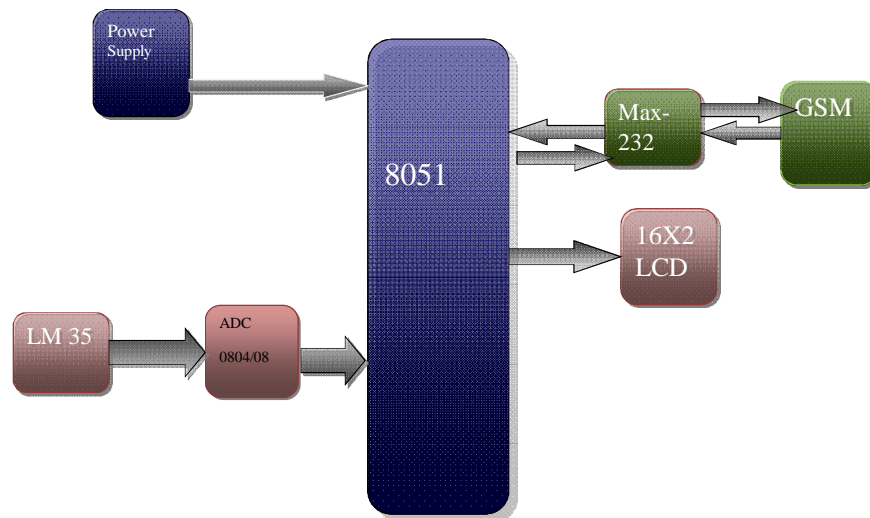
These systems can sense, control and activate mechanical process on the micro scale and they can also function individually or in arrays to generate the effects on the macro scale. The fabrication technology enables fabrication of large array of devices, which individually do simple tasks, but in combination can do many complicated functions.

Actually MEMS is not about one application or device but it is the fabrication approach that conveys the advantages of miniaturization, multiple components and microelectronics to the design and construction of integrated electromechanical systems. MEMS are like it identifies the action and indicate the action to the receiver.

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II. EXISTING METHOD

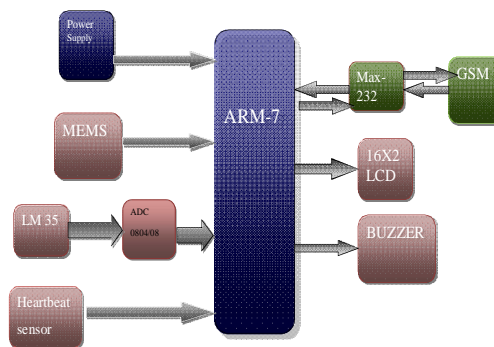
Previously we were using Bluetooth based human health monitoring system. In this the distance is 70-100m which is limited range. When the doctor is in outside the message will not go to the doctor that time patient condition will serious. Doctor was not available In receiver side we place one monitor in the room where technician is present. Technician should be available all the time and he should be always watching the PC. Whenever the technician notices any changes in the PC immediately he has to call to the doctor to intimate the patient condition. In this method we can monitor only temperature.



BLOCK DIAGRAM

III. PROPOSED METHOD

This project is for physically disabled people who cannot express their feelings about the pain they have. In this project we are using GSM which is of unlimited range. The condition of the patient will be sent to the doctor's mobile at the same time buzzer which is placed in the hospital will sound this indicates that the patient is in trouble. MEMS play a major role to help the physically challenged people they just show the signs by their fingers about their pain. Each finger have some operation that gives the doctors about the patients condition by message to mobile, buzzer .In this project we can monitor patients heart beat, blood pressure, breathing problem, chest pain, temperature parameters. If any of the about parameter exceeds the limits the buzzer will sound, that will be displayed on LCD display and message will be sent to the doctor.



BLOCK DIAGRAM

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A. LPC2148

It is one of the extensive processor in the world. The first ARM processor was developed in the year 1978 and the first ARM RISC processor was produced by the Acorn Group of Computers in the year 1985. These processors are used in portable devices like digital cameras, mobile phones, home networking modules and wireless communication technologies and other embedded systems projects such as low power consumption. 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. It has 8 to 40 kB of RAM and 32 to 512 kB of ROM. 128 bit wide interface that enables high speed 60 MHz operation. Single flash or full chip erase in 400 ms and programming of 256 bytes in 1 ms and it also have LPC2146/8 provide 8 kB of on-chip RAM accessible to USB by DMA. Two 10-bit A/D converters (AD0 and AD1) provide conversion times as low as 2.44 μ s per channel. Single 10-bit D/A converter provide variable analog output. Two 32-bit timers each timer with four captures and four compare channels PWM unit (six outputs) Watchdog timer.

B. LM35 Temperature Sensor

LM35 converts temperature value into electrical signals. In this project LM35 sensor measures and takes the readings of the patient every hour. If the temperature exceed the limit than normal buzzer sounds and the message will be sent to the doctors mobile. The LM35 donot require any external calibration because it is internally calibrated. LM35 does not require any external calibration to provide accuracy room temperature of $\pm 1/4^{\circ}\text{C}$ and $\pm 3/4^{\circ}\text{C}$ over a full -55 to $+150^{\circ}\text{C}$ temperature range. LM35 contain low output impedance, linear output which make interfacing to read or control circuitry easy. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C . It is Suitable for remote applications. It operates from 4 to 30 volts and it is Less than 60 μA current drain.

C. Heart Beat Sensor

Heart beat sensor is one type of sensor which monitors the heart beat pulses for every minute. It will check the heart beat pulses and the same time data will be given to microcontroller. When finger is placed heart beat sensor gives the digital output of the heart beat. This digital output is connected to microcontroller directly to measure the heart beat every minute. The sensor consists of a bright red LED and light detector. The LED needs to be super bright as the light must pass through finger and detected at other end. When the blood is pumped through blood vessels of the heart, the finger becomes slightly more opaque so less light is reached the detector. With each heart pulse the detector signal varies. This signal will be amplified and triggered with an amplifier and gives output +5v logic level signal. The output signal is also indicated on top by a LED which blinks on each heart beat.

D. MEMS Micro Electro Mechanical System

MEMS means Micro-Electro-Mechanical-System. Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. MEMS sensing element have 3 directions x,y,z. This sensing element have 5 pins VCC, GND, x, y, z directions. MEMS will be placed on the chest or hand whenever the patient feel pain then he shows some direction that direction will be recognized by MEMS and sounds buzzer automatically and send the message to the doctor about the pain of the patient. MEMS is a technology which Allows the development of smart products. MEMS are quietly changing the way you live, in ways that you might never imagine. MEMS are finding their way into a variety of medical devices, and everyday consumer products.



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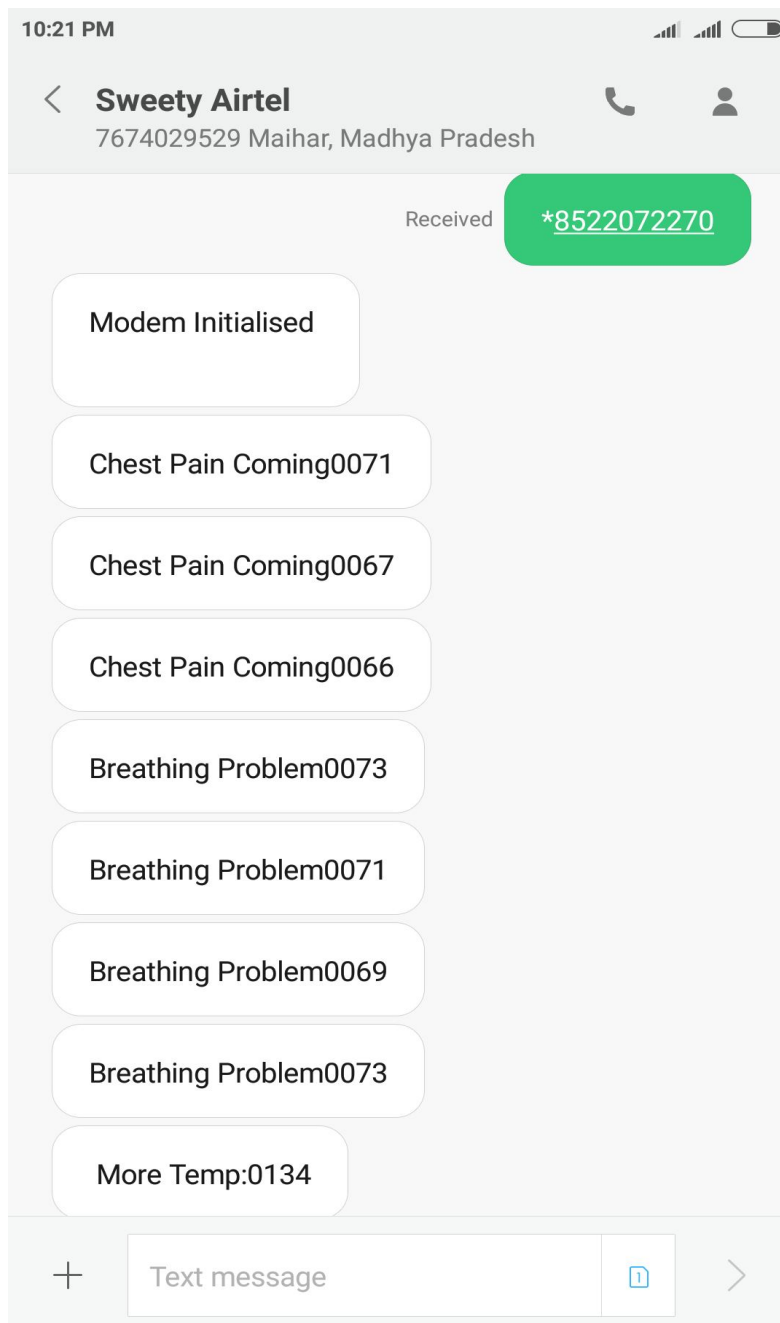
E. Buzzer

Digital systems and microcontroller pins don't have sufficient drive the circuits like relays, buzzer circuits etc because these circuits require around 10milli amps to be operated, the microcontroller's pin provide a maximum of 1-2milli amps current. so a driver such as a power transistor is placed in between the microcontroller and the buzzer circuit.

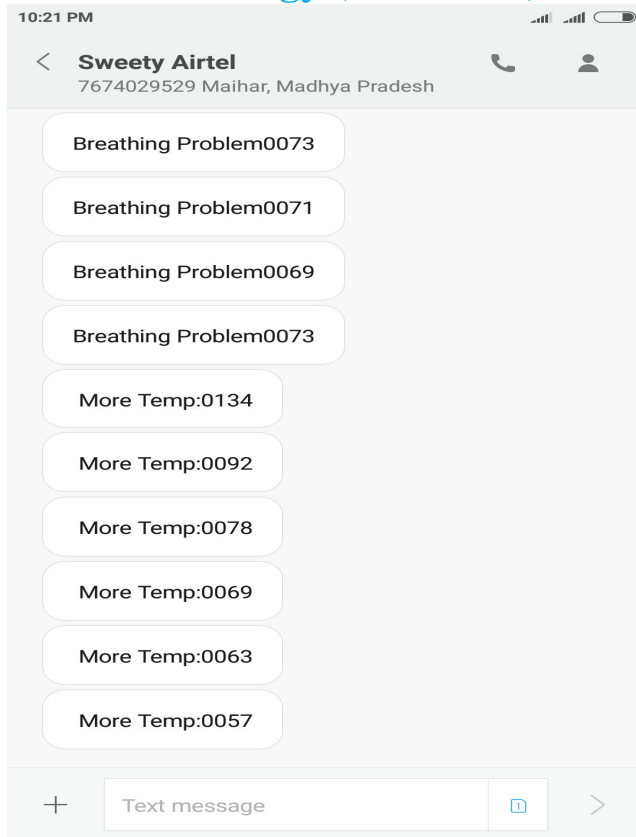
F. ADC

Analog-to-digital converters are the most widely used devices for data acquisition. Digital systems use binary values, but in the physical world everything is continuous i.e., analog values. The physical analog quantities are Temperature, pressure (wind or liquid), humidity and velocity

IV. RESULT



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V. CONCLUSION

A wireless patient monitoring system to measure heartbeat, chest pain, breathing problem, temperature, blood pressure. This is a convenient process to monitor the patient's health conditions from remote areas by GSM technology. This project provides real time update of the patient's health to the doctor along with necessary preliminary action taken by physician in case of his absence.



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