PULMONARY EDEMA MONITORING SENSOR WITH INTEGRATED BODY-AREA NETWORK FOR REMOTE MEDICAL SENSING

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report titled**"PULMONARY EDEMA MONITORING SENSOR WITH INTEGRATED BODY-AREA NETWORK FOR REMOTE MEDICAL SENSING"** is the bonafied work of "**PONMALAR.M, SHANKARI.C, VAISHNAVI.G"** who carried out the project work under my supervision.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

The basic idea behind this project is to diagnose pulmonary edema by using a wearable health monitoring sensor with electrodes.As we found it difficult to demonstrate , we have modified it just by placing the electrodes on the muscles which checks out whether they are normal or not.this is done by interfacing the signals from the electrodes to the PIC Microcontroller. The output can be obtained as either analog or digital values. For the purpose of obtaining as a digital output we have used a particular android application which shows the rating. The main advantage is, the remote data transfer of the details of the patient when the doctor is not near in any critical situations. Being a starting stage we have just used Bluetooth for the data transfer which can be replaced by wireless communication for longer distances.

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LIST OF ABBREVIATIONS

RISC	Reduced Instruction Set Computer
JTAG	Joint Test Access Group
LCD	Liquid Crystal Display
POR	Power On Reset
PWRT	Power-up Timer
OST	Oscillator Start-up Timer
WDT	Watchdog Timer
ICSP	In-Circuit Serial Programming
SSP	Synchronous Serial Port
USART	Universal Synchronous Asynchronous Receiver Transmitter
BOR	Brown Out Reset
EMG	Electromyography
PAN	Personal Area Networks
CMOS	Complementary Metal Oxide Semiconductor
PSU	Power Supply Unit
JVM	Java Virtual Machine
MC	Microcontroller
UHF	Ultra High Frequency
OS	Operating System
PC	Personal Computer
PIC	Personal Interface Controller
ISM Band	Industrial Scientific and Medical ratio Band
EPROM	Erasable Programmable Read Only Memory
EEPROM	Electrically Erasable Programmable Read Only Memory
USB	Universal Serial Port
RAM	Random Access Memory
GPS	Global Positioning System

ADF	Adaptive Frequency Hoping
AC	Alternate Current
DC	Direct Current
DQPSK	Differential Quadrature Phase Shift Keying
EDH	Enhanced Data Rate
PCLATCH	Program Counter Latch

LIST OF FIGURES

CHAPTER 1
INTRODCTION

Pulmonary edema is fluid accumulation in the lungs, which collects in air sacs. This fluid collects in air sacs in the lungs, making it difficult to breathe. It leads to impaired gas exchange and may cause respiratory failure.Pulmonary edema is mainly due to the heart not removing fluid from lung circulation properly (cardiogenic pulmonary edema). A direct injury to the lung prenchuma can also lead to pulmonary edema.

Basically microcontrollers are used widely in developing applications that are of more use directly for users rather than those oriented with the industrial application control.One such application used here is with the help of Pic microcontroller where we used to diagnose pulmonary edema by the use of electrodes.The program burnt into the microcontroller helps to identify and detect the abnormal stages and gives out the values.

Since we found it difficult to demonstrate,we tried by testing the EMG electrodes placed on the muscles.When the muscles are kept immovable the rating displays a value and when there is movement given it shows another value.In similar way we can diagnose pulmonary edema by deep tissue detection.The main advantage is that this can be used by normal people at their own localities and test themselves and send the report to the doctor in case of any emergencies.Data transmission is done here using bluetooth as an initial stage. Android application is used to read the data transferred. Treatment usually focuses on improving respiratory function and dealing with the source of the problem.

CHAPTER 2

HARDWARE DESCRIPTION

2.1 BLOCK DIAGRAM

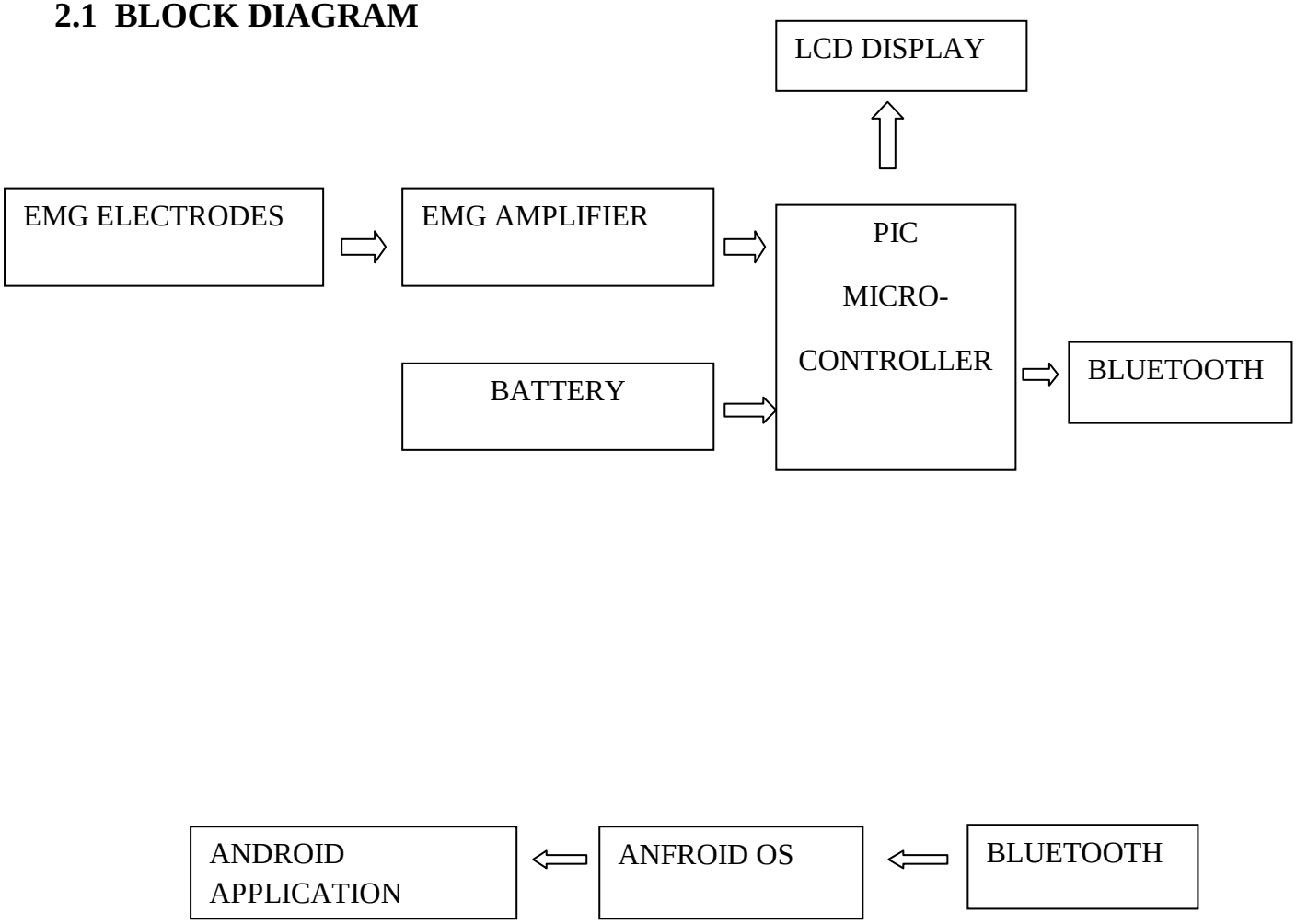

Fig 2.1a Block diagram of pulmonary edema monitoring system

2.1.1 DESCRIPTION

Battery

DC storage and power supply for the microcontroller. An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work . Primary (single-use or "disposable") batteries are used once and discarded; the electrode materials are irreversibly changed during discharge. Common examples are the alkaline battery used for flashlights and a multitude of portable devices. Secondary (rechargeable batteries) can be discharged and recharged multiple times; the original composition of the electrodes can be restored by reverse current. Examples include the lead-acid batteries used in vehicles and lithium ion batteries used for portable electronics.

Electromyography(EMG) Electrodes

It is used to obtain the signal from body tissues**.** Electromyography (EMG) is an electrodiagnostic medicine technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using an instrument called an electromyograph, to produce a record called an electromyogram. An electromyograph detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, or recruitment order or to analyze the biomechanics of human or animal movement. EMG signals have a variety of clinical and biomedical applications. EMG is used as a diagnostics tool for identifying neuromuscular diseases or as a research tool for studying kinesiology, and disorders of motor control.

EMG amplifier

It amplifies the weak body signals and produces an acceptable level of input to the microcontroller. The EMG Electromyogram Amplifier amplifies general and skeletal muscle electrical activity. The amplifier functions directly with Acqknowledge to perform real-time EMG integration. As it incorporates fas response and settling time characteristics, it can also be used to monitor single-fiber EMG, motor unit, and peripheral nerve action potentials. Use the AcqKnowledge software to automatically integrate the raw EMG signals and provide a detailed frequency analysis of the EMG data.

Liquid Crystal Display

It displays the output of microcontroller and for verification. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Bluetooth

It facilitates communication between microcontroller and Android phone. Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks(PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.The distance for Bluetooth transmission ranges from 10-15 meters.Only for low cost this type of transmission is preferred a lot.

Android application

It is used to interfaces the microcontroller and Android phone.Android is a mobile operating system(OS) based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, Android is designed primarily for touchscreen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touchscreen input, it also has been used in game consoles, digital cameras, regular PCs (e.g.the HP Slate 21) and other electronics.

2.2 PIC Microcontroller:

2.2.1 PIN Diagram:

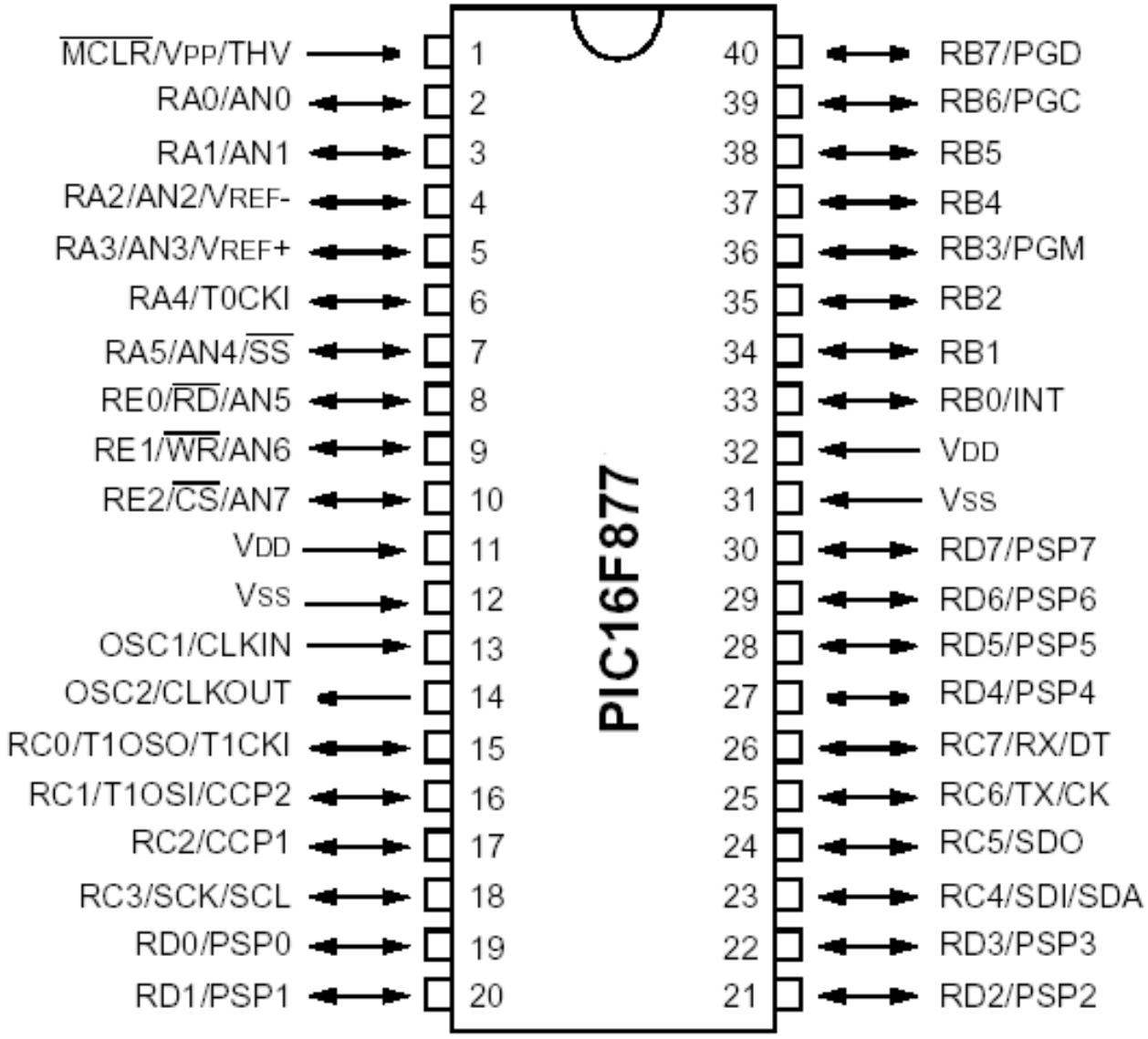

Fig 2.2a Pin Diagram of PIC Microcontroller

2.2.2 Introduction

The microcontroller that has been used for this project is from PIC series. A PIC microcontroller is a processor with built in memory and RAM and you can use it to control your projects (or build projects around it). So it saves you building a circuit that has separate external RAM, ROM and peripheral chips.PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complimentary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory.

The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques. PIC microcontrollers designed by Microchip Technology are likely the right choice for you if you are the beginner. The real name of this microcontroller is PICmicro (Peripheral Interface Controller), but it is better known as PIC. Its first ancestor was designed in 1975 by General Instruments. This chip called PIC1650 was meant for totally different purposes. About ten years later, by adding EEPROM memory, this circuit was transformed into a real PIC microcontroller

PIC (16F877)

PIC 16F877 is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on. The PIC 16F877 features all the components which modern microcontrollers normally have. Various microcontrollers offer different kinds of memories. EEPROM, EPROM,

FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and Erasing are other features of PIC 16F877.

CORE FEATURES

It has high-performance RISC CPU and has only 35 single word instructions to learn.All single cycle instructions except for program branches which are two cycle and the operating speed is DC - 20 MHz clock input, Interrupt capability is up to 14 internal/external eight level deep hardware stack. Direct, indirect, and relative are the types of addressing modes.Power-on Reset (POR),Power-up Timer (PWRT) and Oscillator Start-up Timer (OST), Watchdog Timer (WDT) with its own on-chip RC Oscillator are used for reliable operation.There is complete programmable code-protection,power saving SLEEP mode,selectable oscillator options,low-power, high-speed CMOS EPROM/EEPROM technology.It is designed completely in a static manner.The temperature range is commercial and industrial.The low power consumption range 2mA typical @ 5V, 4 MHz and 20mA typical @ 3V, 32 kHz 1mA.

PERIPHERAL FEATURES

The Timer0 is 8-bit timer/counter with 8-bit prescaler.Timer1 is 16-bit timer/counter with prescaler, can be incremented during sleep via external crystal/clock.Timer2 is 8-bit timer/counter with 8-bit period register, prescaler and postscaler Two Capture, Compare, PWM modules.The max resolution of capture is 12.5 ns and for compare is 200 ns.It has 10-bit multi-channel Analog-to-Digital converter.Synchronous Serial Port (SSP) with SPI. (Master Mode) and I2C(Master/Slave), Universal Synchronous Asynchronous Receiver

Transmitter (USART/SCI) with 9- bit used for address detection. Brown-out Reset (BOR) is used for brown-out detection circuitry.

2.2.3 Features of PIC

1. Code efficiency

The PIC 8 bit microcontroller is based on Harvard architecture, which means there are separate internal buses for memory and data. The throughput rate is therefore increased due to simultaneous access to both data and program memory. It would be easier if you have known about von neumann architecture which has common bus for memory and data. Code efficiency is a broad term used to depict the reliability, speed and programming methodology used in developing codes for an application. Code efficiency is directly linked with algorithmic efficiency and the speed of runtime execution for software. It is the key element in ensuring high performance. The goal of code efficiency is to reduce resource consumption and completion time as much as possible with minimum risk to the business or operating environment. The software product quality can be accessed and evaluated with the help of the efficiency of the code used.

2. Safety

All the instructions fit into a 12 or 14 bit program memory word. There is no likelihood of software jumping onto the DATA section of a program and executing. An External oscillator is installed within the microcontroller and connected to the OSC1 and OSC2 pins. It is called “external” because it relies on external circuitry for the clock signal and frequency stabilization, such as a stand-alone oscillator, quarts crystal, ceramic resonator or resistor-capacitor circuit. The oscillator mode is selected by bits of bytes sent during programming, so called Config Word. The required turn ON/OFF times depend on many aspects, which I don't want to get into.

3. Instruction set

There are 33 instructions you have to learn in order to write software for the 16C5x family.The lesser number of instruction eases our job while writingprogram. An instruction set, or instruction set architecture (ISA), is the part of the computer architecture related to programming, including the native data types, instructions, registers, addressing modes, memory architecture, interrupt and exception handling, and external I/O.

4.Speed

The PIC has an internal divide by 4 connected between the oscillator and the internal clock bus(note : we know their is a divide by 2 in a 8085 microprocessor where we connect a 6Mhz clock inorder to operate the microprocessor at a speed of 3Mhz). The PIC is very fast to work with. The speed of PIC16F877A is 20Mhz but it can even operate at a speed of 30Mhz.

5.Static Operation

The PIC is a fully static microcontroller, in other words, if you top the clock, all the register contents are maintained. In practise you would not actually do this, you would place the PIC into a Sleep mode-this stops the lock and sets up various flags within th ePIC to allow you to know what state it was in before the Sleep. In sleep, the PIC takes only its standby current which can be less than 1uA. The need for sleep mode can be easily understood by considering the Fire alarm circuit, since the circuit has to be activated only when their is a fire, the rest of the time the PIC can be made to be in its sleep mode and wake up when their is fire thus saving the power required for the operation of PIC.

6.Drive Capability

The PIC has a high output drive capability and can directly drive LEDs and TRIACs etc. Any I/O pin can sink 25mA or 100mA for the device.

When people say "poor gate drive capability" they mean that the turn ON and turn OFF times of the transistor in given configuration are too long."Too long

compared to what?" you might ask, and this is the most important question to ask. The required turn ON/OFF times depend on many aspects, which I don't want to get into. Just as an example, think of driving the transistor with a periodic square wave having 50% duty cycle and period of 10ms. You want the transistor to be ON during the high phase and OFF during the low phase of the signal. Now, if the turn ON time of the transistor in a given configuration will be 10ms, it is clear that 5ms of high phase signal will not be enough to turn it on at all. The given configuration has "poor gate drive capability".

7.Options

A range of speed, temperature, package, I/O lines, timer functions, serial communication, A/D and memory sizes is available from the PIC family to suit requirments. PIC microcontroller can be programmed using embedded C. some of the compilers which i have used are mikroC, CCS C compiler and Mplab. It is easier to program in embedded C rather than programming in assembly language. The demo version of these compilers can compile upto 2KB of program memory.

2.2.4 Advantages

The instruction set to learn is small and has RISC architecture,built-in oscillator with selectable speeds , easy entry level, in-circuit programming plus in-circuit debugging PIC kit units available for less than $50.These controllers are inexpensive. The availability of processors in Dual In Line package make them easy to handle for hobby use.

Limitations

It has one accumulator. The register-bank switching is required to accessthe entire RAM of many devices.Operations and registers are not orthogonal. Some instructions can address RAM and/or immediate constants,

while others can use the accumulator only.The hardware call stack is not addressable, so preemptive task switching cannot be implemented.Software mplemented stacks are not efficient, so it is difficult to generate reentrant and support local variables.With paged program memory, there are two page sizes to worry about one for CALL and GOTO and another for computed GOTO . For example, on PIC16, CALL and GOTO have 11 bits of addressing, so the page size is 2048 instruction words. For computed GOTOs, where you add to PCL, the page size is 256 instruction words. In both cases, the upper address bits are provided by the PCLATH register. This register must be changed every time control transfers between pages. PCLATH must also be preserved by any interrupt handler.

2.2.5 Applications of PIC

The day-to-day applications include home alarm system, LCD controller, bus scanner ,computer interface. With a single application, applicants can apply through PIC to a variety of projects and programs listed in the PIC Directory including supportive housing, attendant outreach services and transitional and life skills program. Applicants need to refer to the PIC Directory for information about the PIC application, eligibility criteria, and attendant service projects you can apply in this application.

2.3 ELECTRODE

2.3.1 INTRODUCTION

An electrode is an electrical conductor used to make contact with a nonmetallic part of a circuit (e.g. a semiconductor, an electrolyte or a vacuum). Here we have used a dispatachable electrode to obtain nsignals from the skins permittivity. The potential difference, which is measured in *volts* (v), depends upon the particular substances constituting the electrodes. For any electric cell, the total potential is the sum of those produced by the reactions at the two electrodes. The EMF denotes electromotive force**,** another name for electrical potential.

An electrode is a conductor that passes an electrical current from one medium to another, usually from a power source to a device or material. It can take a number of different forms, including a wire, a plate, or a rod, and is most commonly made of metal, such as copper, silver, lead, or zinc, but can also be made of a non-metallic substance that conducts electricity, such as graphite. Electrodes are used in welding, electroplating, batteries, medicine, and in industry for processes involving electrolysis.

In the case of a direct (DC) current, electrodes come in pairs, and are known as anodes and cathodes. For a battery, or other DC source, the cathode is defined as the electrode from which the current leaves, and the anode as the point where it returns. For reasons that are historical rather than scientific, electricity in a circuit is, by convention, depicted as traveling from positive to negative, so that it is seen as a flow of positive charge out from the cathode, and into the anode. An electrical current, however, consists of a flow of tiny negatively charged particles called electrons, so this flow is actually in the opposite direction. In this context, it is probably better to think simply in terms of positive and negative terminals.

2.3.2 USES OF ELECTRODE

Electrodes are used to provide current through nonmetal objects to alter them in numerous ways and to measure conductivity for numerous purposes. Electrodes are used in arc welding, a technique for joining two pieces of metal using a large electric current. A consumable electrode melts, and provides the material that joins the metals. The non-consumable type is made from a material with a very high melting point, such as tungsten, and simply provides the heat to melt another material that forms the join. In medicine, electrodes may be used in an emergency to apply an electric current to the heart.

2.4 EMG MONITORING CIRCUIT:

INTRODUCTION

Electromyography (**EMG**),an technique for evaluating and recording the electrical activity produced by skeletal muscles.EMG is performed using an instrument called an **electromyograph**, to produce a record called an **electromyogram**. An electromyograph detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, or recruitment order or to analyze the biomechanics of human or animal movement.

In this circuit there are three electrod is used to measure the ECG waves in which two electrod is fixed with left and right hand another one electrod is fixed in the right leg which acts as reference ground electrod. Electrod 1 and Electrod 2 pick up the ECG waves from the both hands. Then the ECG waves are given to instrumentation amplifier section.

There are two kinds of EMG: surface EMG and intramuscular EMG. Surface EMG assesses muscle function by recording muscle activity from the surface above the muscle on the skin. Surface electrodes are able to provide only a limited assessment of the muscle activity. Surface EMG can be recorded by a pair of electrodes or by a more complex array of multiple electrodes. More than one electrode is needed because EMG recordings display the potential difference (voltage difference) between two separate electrodes. Limitations of this approach are the fact that surface electrode recordings are restricted to superficial muscles, are influenced by the depth of the subcutaneous tissue at the site of the recording which can be highly variable depending of the weight of a patient, and cannot reliably discriminate between the discharges of adjacent muscles.

Intramuscular EMG can be performed using a variety of different types of recording electrodes. The simplest approach is a monopolar needle electrode. This can be a fine wire inserted into a muscle with a surface electrode as a reference; or two fine wires inserted into muscle referenced to each other. Most commonly fine wire recordings are for research or kinesiology studies. Diagnostic monopolar EMG electrodes are typically stiff enough to penetrate skin and insulated, with only the tip exposed using a surface electrode for reference. Needles for injecting therapeutic botulinum toxin or phenol are typically monopolar electrodes that use a surface reference, in this case, however, the metal shaft of a hypodermic needle, insulated so that only the tip is exposed, is used both to record signals and to inject. Slightly more complex in design is the concentric needle electrode. These needles have a fine wire, embedded in a layer of insulation that fills the barrel of a hypodermic needle, that has an exposed shaft, and the shaft serves as the reference electrode.

The exposed tip of the fine wire serves as the active electrode. As a result of this configuration, signals tend to be smaller when recorded from a concentric electrode than when recorded from a monopolar electrode and they are more resistant to electrical artifacts from tissue and measurements tend to be somewhat more reliable. However, because the shaft is exposed throughout its length, superficial muscle activity can contaminate the recording of deeper muscles. Single fiber EMG needle electrodes are designed to have very tiny recording areas, and allow for the discharges of individual muscle fibers to be discriminated.

To perform intramuscular EMG, typically either a monopolar or concentric needle electrode is inserted through the skin into the muscle tissue. The needle is then moved to multiple spots within a relaxed muscle to evaluate both insertional activity and resting activity in the muscle. Normal muscles exhibit a brief burst of muscle fiber activation when stimulated by needle

movement, but this rarely lasts more than 100ms. The two most common pathologic types of resting activity in muscle are fasciculation and fibrillation potentials. A fasciculation potential is an involuntary activation of a motor unit within the muscle, sometimes visible with the naked eye as a muscle twitch or by surface electrodes. Fibrillations, however, are only detected by needle EMG, and represent the isolated activation of individual muscle fibers, usually as the result of nerve or muscle disease. Often, fibrillations are triggered by needle movement (insertional activity) and persist for several seconds or more after the movement ceases.

After assessing resting and insertional activity, the electromyographer assess the activity of muscle during voluntary contraction. The shape, size, and frequency of the resulting electrical signals are judged. Then the electrode is retracted a few millimetres, and again the activity is analyzed. This is repeated, sometimes until data on10–20 motor units have been collected in order to draw conclusions about motor unit function. Each electrode track gives only a very local picture of the activity of the whole muscle. Because skeletal muscles differ in the inner structure, the electrode has to be placed at various locations to obtain an accurate study.

Single fiber electromyography assessed the delay between the contractions of individual muscle fibers within a motor unit and is a sensitive test for dysfunction of the neuromuscular junction caused by drugs, poisons, or diseases such as myasthenia gravis. The technique is complicated and typically only performed by individuals with special advanced training. Surface EMG is used in a number of settings; for example, in the physiotherapy clinic, muscle activation is monitored using surface EMG and patients have an auditory or visual stimulus to help them know when they are activating the muscle (biofeedback). A review of the literature on surface EMG published in 2008 concluded that surface EMG may be useful to detect the presence of

neuromuscular disease (level C rating, class III data), but there are insufficient data to support its utility for distinguishing between neuropathic and myopathic conditions or for the diagnosis of specific neuromuscular diseases. sEMG may be useful for additional study of fatigue associated with post-poliomyelitis syndrome and electromechanical function in myotonic dystrophy (level C rating, class III data).Certain US states limit the performance of needle EMG by nonphysicians. New Jersey declared that it cannot be delegated to a physician's assistant. Michigan has passed legislation saying needle EMG is the practice of medicine. Special training in diagnosing medical diseases with EMG is required only in residency and fellowship programs in neurology, clinical neurophysiology, neuromuscular medicine, and physical medicine and rehabilitation. There are certain subspecialists in otolaryngology who have had selective training in performing EMG of the laryngeal muscles, and subspecialists in urology, obstetrics and gynecology who have had selective training in performing EMG of muscles controlling bowel and bladder function.The instrumentation amplifier is constructed by the TL072 operational amplifier. The technique is complicated and typically only performed by individuals with special advanced training. Surface EMG is used in a number of settings; for example, in the physiotherapy clinic, muscle activation is monitored using surface EMG and patients have an auditory or visual stimulus to help them know when they are activating the muscle (biofeedback).

2.4.1 TL072

The TL072, TL072A and TL072B are high speed J–FET input dual operational amplifiers incorporating well matched, high voltage J–FET and bipolar transistors in a monolithic integrated circuit. The devices feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.The TL072 are high speed J-FET input dual operational amplifier incorporating well matched, high voltage J-FET and bipolar transistors in a

monolithic integrated circuit. The deivces feature high slew rates, low input bias and offset current and low offset voltage temperature coefficient

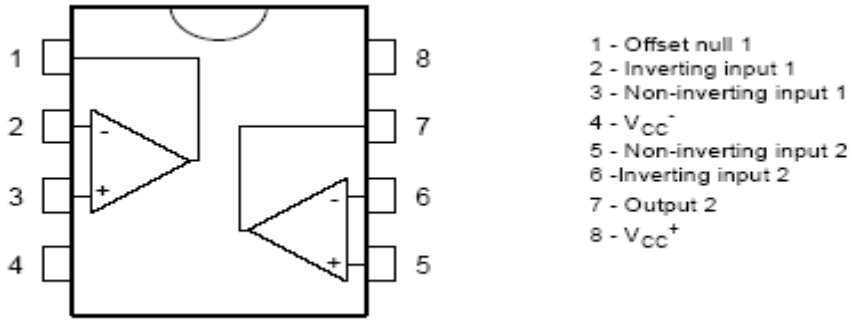

Fig 2.4a Pin Diagram of TL072

The instrumentaion amplifier amplifiy the differential signal from the both electrode. This amplified ECG waves contains the line frequency, high frequencand low frequency noise signals. So the ECG wave is fed to filter section.

2.4.2 IN4148

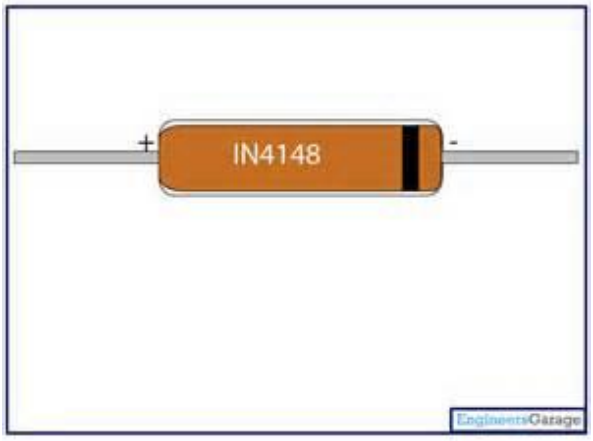

Fig 2.4b Pin diagram of IN4148

DESCRIPTION

The 1N4148 and 1N4448 are high-speed switching diodes fabricated in planar technology, and encapsulated in hermetically sealed leaded glass SOD27 (DO-35) packages. The 1N4148 is a standard silicon switching diode. It is one of the most popular and long-lived switching diodes because of its dependable specifications and low cost. Its name follows the JEDEC nomenclature. The 1N4148 is useful in switching applications up to about 100 MHz with a reverse-recovery time of no more than 4 ns.The 1N4148 comes in a DO-35 glass package for thru-hole mounting. This is useful for breadboarding of circuits. A surface mount device, 1N4148WS, is available in a plastic SOD package.

FEATURES

The diode is hermetically sealed with leaded glass.The type of package is SOD27 (DO-35) package.It has high switching speed maximum 4 ns.The continuous reverse voltage ismaximum of 75 V.The repetitive peak reverse voltage is maximum 100 V.The repetitive peak forward current is maximum of 450 mA. The 1N4148 is a standard silicon switching diode. It is one of the most popular and long-lived switching diodes because of its dependable specifications and low cost. Its name follows the JEDEC nomenclature. The 1N4148 is useful in switching applications up to about 100 MHz with a reverse-recovery time of no more than 4 ns.The 1N4148 comes in a DO-35 glass package for thru-hole mounting. This is useful for breadboarding of circuits. A surface mount device, 1N4148WS, is available in a plastic SOD package.

As the most common mass-produced switching diode, the 1N4148 replaced the older 1N914,which had a 200 times greater leakage current: 5 µA vs. 25 nA. Since leakage is usually an undesirable property, today manufacturers produce the 1N4148 and sell it as either part number. It was second-sourced by

many manufacturers; Texas Instruments listed their version of the device in an October 1966 data sheet. These device types have an enduring popularity in low-current applications.

2.4.3 TLO74

DESCRIPTION

The TL074, TL074A and TL074B are high speed J–FET input quad operation amplifiers incorporating wellmatched,highvoltageJ–FETand bipolar transistors in a monolithic integrated circuit.The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

FEATURES

The power consumed is low.The modes used are wide common-mode (up to vcc+) and differential voltage range .Low input bias and offset current ,low noise,output short-circuit protection ,high input impedance jfet inputstage ,low harmonic distortion, internal frequency compensation ,latch up free operation high slew rate. The TL074, TL074A, and TL074B are high-speed JFET input single operational amplifiers. Each of these JFET input operational amplifiers incorporates well matched, high-voltage JFET and bipolar transistors in a monolithic integrated circuit. The energy efficiency of a power supply drops significantly at low loads. Therefore it is important to match the capacity of a power supply to the power needs of the computer. Efficiency generally peaks at about 50–75% load. Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source. . It is one of the most popular and long-lived switching diodes because of its dependable specifications and low cost. Its name follows the JEDEC nomenclature. Useful in switching applications up to about 100 MHz with a reverse-recovery time of no more than 4 ns

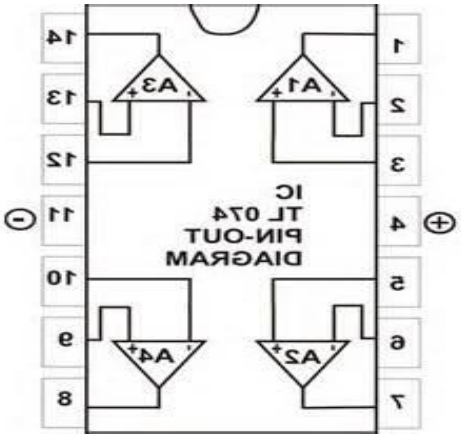

Fig2.4c Pin diagram of TL074

2.4.4 7805-VOLTAGE REGULATOR

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.A fixed three-terminal voltage regulator has an unregulated dc input voltage , applied to one input terminal, a regulated dc output voltage, from a second terminal, with the third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.This is a regulated power supply circuit using the 78xx IC series. These regulators can deliver current around 1A to 1.5A at a fix voltage levels. The common regulated voltages are 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, and 24V. It is important to add capacitors across the input and output

of the regulator IC to improve the regulation. In this power supply circuit we get 5, 12 and -12Volt output.

DESCRIPTION

The L7800 series of three-terminal positiveregulators is available in TO-220 TO-220FP TO-3and D2PAK packages and several fixed outputvoltages, making it useful in a wide range of applications.These regulators can provide localon-card regulation, eliminating the distributionproblems associated with single point regulation.Each type employs internal current limiting,thermal shut-down and safe area protection,making it essentially indestructible. If adequateheat sinking is provided, they can deliver over 1A output current. Although designed primarily asfixed voltage regulators, these devices can beused with external components to obtain adjustable voltages and currents

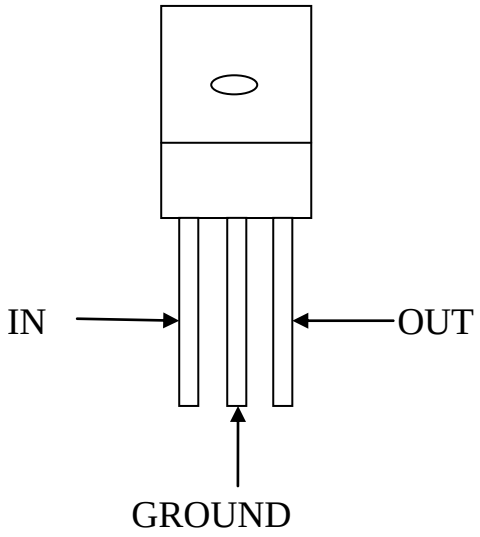

Fig 2.4d Pin diagram of 7805 regulator

2.5 Power supply

A power supply unit (PSU) converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use a switched-mode power supply. Some power supplies have a manual selector for input voltage, while others automatically adapt to the supply voltage. The energy efficiency of a power supply drops significantly at low loads. Therefore it is important to match the capacity of a power supply to the power needs of the computer. Efficiency generally peaks at about 50–75% load. Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source. Depending on its design, a power supply may obtain energy from various types of energy sources, including electrical energy transmission systems,energy storage devices such as a batteries and fuel cells, electromechanical systems such as generators and alternators, solar power converters, or another power supply

2.5.1 Block diagram

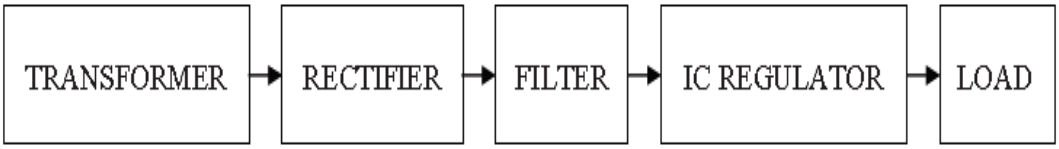

Fig 2.5a Block diagram of power supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies. This voltage regulation is usually obtained using

one of the popular voltage regulator IC units. All power supplies have a power input, which receives energy from the energy source, and a power output that delivers energy to the load. In most power supplies the power input and output consist of electrical connectors or hardwired circuit connections, though some power supplies employ wireless energy transfer in lieu of galvanic connections for the power input or output. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

2.5.2 Circuitdiagram

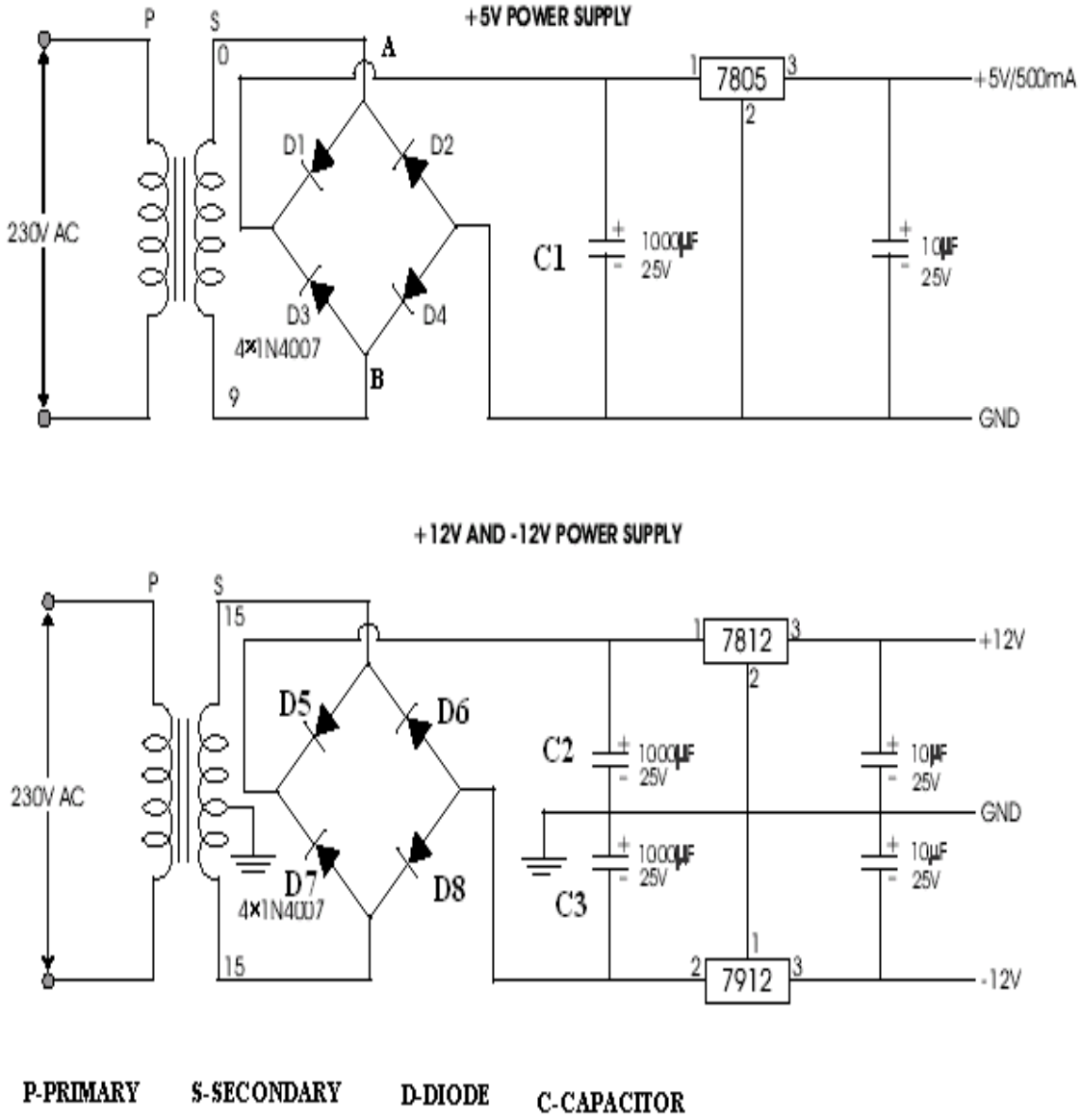

Fig 2.5d Circuit diagram of power supply

Working principle

Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-9Vand 15-0-15) level. If the secondary has less turns in the coil then the primary, the secondary coil's voltage will decrease and the current or AMPS will increase or decreased depend upon the wire gauge. **This is called a STEP-DOWN transformer.** Then the secondary of the potential transformer will be connected to the rectifier.

Bridge rectifier

When four diodes are connected the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.The path for current flow is from point B through D1, up through Load, through D3, through the secondary of the transformer back to point B. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through Load, through D2, through the secondary of transformer, and back to point A. Across D2 and D4. The current flow through Load is always in the same direction. In flowing through Load this current develops a voltage corresponding to that.

Positive 12 and Negative 12 Volt circuit

The unregulated AC/DC power supply part of the circuit consists of a transformer that steps down 230V AC to 15 volts across a center tapped

secondary winding 15V AC individually across the two halves of the secondary winding with opposite polarities, diodes (D5) to (D8) that rectify the AC appearing across the secondary with (D5) and (D7) providing ‘full wave rectification to produce a positive output, (D6) and (D8), providing full wave rectification to produce a negative output, capacitors (C2) and (C3) providing the filtering action.. 7812 is a fixed output positive three terminal regulator whereas 7912 is a fixed output negative three terminal regulator.

Filter

It is a device (usually a membrane or layer) that is designed to physically block certain objects or substances while letting others through, a semi-permeable paper barrier placed perpendicular to a liquid or air flow. It is used to separate fine solids from liquids or air, a device composed of fibrous materials which removes solid particulates such as dust, pollen, mold, and bacteria from the air. If a simple Filter Circuit, the output of the Rectifier will be transformed into a more stable DC Voltage. At first, the capacitor is charged to the peak value of the rectified Waveform. Beyond the peak, the capacitor is discharged through the load resistor until the time at which the rectified voltage exceeds the capacitor voltage. Then the capacitor is charged again and the process repeats itself.

7805 REGULATOR

The **78xx** (sometimes **L78xx**, **LM78xx**, **MC78xx**...) is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the *xx* is replaced with two digits, indicating the output voltage(for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground. There is a related line of **79xx** devices which are complementary negative

voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit.78xx ICs have three terminals and are commonly found in the TO220 form factor, although smaller surface-mount and larger TO3 packages are available. These devices support an input voltage anywhere from a few volts over the intended output voltage, up to a maximum of 35 to 40 volts depending on the make, and typically provide 1 or 1.5 amperes of current (though smaller or larger packages may have a lower or higher current rating).

There are common configurations for 78xx ICs, including 7805 (5 volt), 7806 (6 volt), 7808 (8 volt), 7809 (9 volt), 7810 (10 volt), 7812 (12 volt), 7815 (15 volt), 7818 (18 volt), and 7824 (24 volt) versions. The 7805 is common, as its regulated 5 volt supply provides a convenient power source for most TTL components. Each device in this series has minimum input voltage to be maintained to get regulated output.

2.6 LIQUID SCREEN DISPLAY

2.6.1 INTRODUCTION

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over and other multi segment LEDs. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

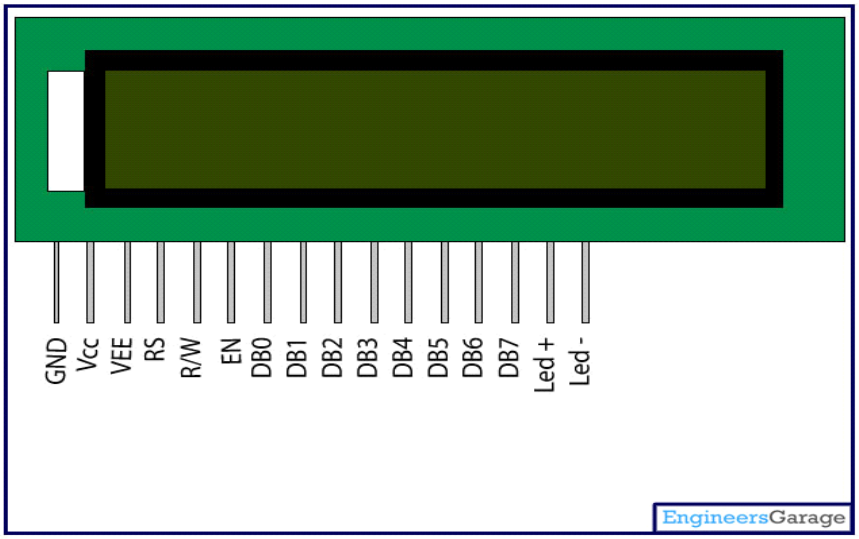

Fig 2.6a Pin diagram of LCD

2.6b Pin description of LCD

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

2.6.2 Methodology

The output current is upto 1.5A and output voltages of 5; 5.2; 6; 8; 8.5; 9;12; 15; 18; 24V.It has thermal overload protection , short circuit protection, output transition protection.

2.7 ANDROID DOCUMENT

2.7.1 INTRODUCTION

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android is a software platform and operating system for mobile devices based on the Linux operating system and developed by Google and the Open Handset Alliance. It allows developers to write managed code in a Java-like language that utilizes Google-developed Java libraries, but does not support programs developed in native code.

The unveiling of the Android platform on 5 November 2007 was announced with the founding of the Open Handset Alliance, a consortium of 34 hardware, software and telecom companies devoted to advancing open standards for mobile devices. When released in 2008, most of the Android platform will be made available under the Apache free-software and open-source license.

Open - Android allows to access core mobile device functionality through standard API calls. All applications are equal - Android does not differentiate between the phone's basic and third-party applications -- even the dialer or home screen can be replaced. Breaking down boundaries - Combine information from the web with data on the phone -- such as contacts or geographic location -- to create new user experiences. Fast and easy development - The SDK contains what need to build and run Android applications, including a true device emulator and advanced debugging tools.Now in all fields android application has become the famous and used by every individual since it is available at low cost and hence no special techniques ned to be known.Even from small kids this has become popular and hence the technology has been improved ,this serves good in case og any emergency also,hence a wide range of availability is there yet now.

2.7.2 HARDWARE ARCHITECTURE

The main hardware platform for Android is the ARM architectur(ARMv7 and ARMv8-Aarchitectures), with and MIPS architectures also officially supported (the latter two became officially supported in later Android versions). Since Android 5.0 "Lollipop", 64-bit variants of all platforms are supported in addition to the 32-bit variant. Unofficial Android-x project used to provide support for the x86 and MIPS architectures ahead of the official support. Since 2012, Android devices with Intel processors began to appear, including phone and tablets. While gaining support for 64-bit platforms, Android was first made to run on 64-bit x86 and then on ARM64

Android devices incorporate many optional hardware components, including still or video cameras, GPS, orientation sensors, dedicated gaming controls, accelerometers, gyroscopes, barometers, magnetometers, proximity sensors, pressure sensors, thermometers, and touchscreens. Some hardware components are not required, but became standard in certain classes of devices, such as smartphones, and additional requirements apply if they are present. Some other hardware was initially required, but those requirements have been relaxed or eliminated altogether. For example, as Android was developed initially as a phone OS, hardware such as microphones were required, while over time the phone function became optional. Android used to require an autofocus camera, which was relaxed to a fixed-focus camera if it is even present at all, since the camera was dropped as a requirement entirely when Android started to be used on set-top boxes. All applications are equal - Android does not differentiate between the phone's basic and third-party applications -- even the dialer or home screen can be replaced. Breaking down boundaries - Combine information from the web with data on the phone -- such as contacts or geographic location -- to create new user experiences.

2.7.3 ANDROID ARCHITECTURE

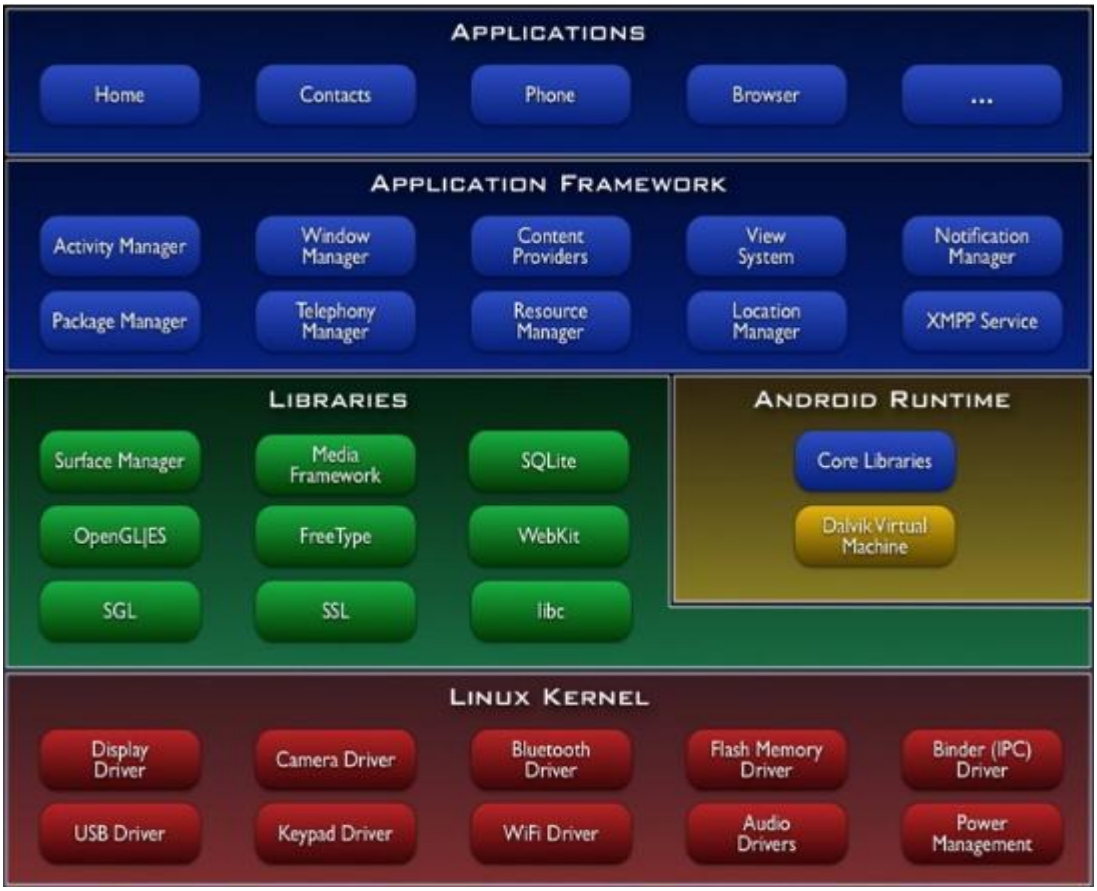

Fig 2.7a Android Architecture

2.7.4 SCOPE

Application framework enabling reuse and replacement of components Dalvik virtual machine optimized for mobile devices. Integrated browser based on the open source WebKit engines. Optimized graphics powered by a custom 2D graphics library; 3Dgraphics based on the OpenGL ES 1.0 specification.SQLite for structured data storage. Media support for common audio, video, and still image.GSM Telephony, Bluetooth, EDGE,

3G, and WiFi,Camera, GPS, compass, and accelerometer. Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE are sone of the other applications.

Developers have full access to the same framework APIs used by the core applications. The application architecture is designed to simplify the reuse of components; any application can publish its capabilities and any other application may then make use of those capabilities (subject to security constraints enforced by the framework). This same mechanism allows components to be replaced by the user. Underlying all applications is a set of services and systems, including a rich and extensible set of Views that can be used to build an application, including lists, grids, text boxes, buttons, and even an embeddable web browser .Content Providers that enable applications to access data from other applications (such as Contacts), or to share their own data. A Resource Manager, providing access to non-code resources such as localized strings, graphics, and lat files.A Notification Manager that enables all applications to display custom alerts in the status bar .An Activity Manager that manages the life cycle of applications and provides a common navigation backstack.

2.8 Bluetooth

2.8.1 Introduction

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization.

Bluetooth operates at frequencies between 2400 and 2483.5 MHz (including guard bands). This is in the globally unlicensed (but not unregulated) Industrial, Scientific and Medical (ISM) 2.4 GHz short-range radio frequency band. Bluetooth uses a radio technology called frequency-hopping spread spectrum. Bluetooth divides transmitted data into packets, and transmits each packet on one of 79 designated Bluetooth channels. Each channel has a bandwidth of 1 MHz. Bluetooth 4.0 uses 2 MHz spacing, which accommodates 40 channels. The first channel starts at 2402 MHz and continues up to 2480 MHz in 1 MHz steps. It usually performs 1600 hops per second, with Adaptive Frequency-Hopping (AFH) enabled.

Originally, Gaussian frequency-shift keying (GFSK) modulation was the only modulation scheme available. Since the introduction of Bluetooth 2.0+EDR, π/4-DQPSK (Differential Quadrature Phase Shift Keying) and 8DPSK modulation may also be used between compatible devices. Devices functioning with GFSK are said to be operating in basic rate (BR) mode where an instantaneous data rate of 1 Mbit/s is possible. The term Enhanced Data Rate (EDR) is used to describe π/4-DPSK and 8DPSK schemes, each giving 2 and 3 Mbit/s respectively. The combination of these (BR and EDR) modes in Bluetooth radio technology is classified as a "BR/EDR radio".

Bluetooth is a packet-based protocol with a master-slave structure. One master may communicate with up to seven slaves in a piconet. All devices share the master's clock. Packet exchange is based on the basic clock, defined by the master, which ticks at 312.5 µs intervals. Two clock ticks make up a slot of 625 µs, and two slots make up a slot pair of 1250 µs. In the simple case of single-slot packets the master transmits in even slots and receives in odd slots. The slave, conversely, receives in even slots and transmits in odd slots. Packets may be 1, 3 or 5 slots long, but in all cases the master's transmission begins in even slots and the slave's in odd slots.

Communication and connection

A master Bluetooth device can communicate with a maximum of seven devices in a piconet (an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master. The Bluetooth Core Specification provides for the connection of two or more piconets to form a scatternet, in which certain devices simultaneously play the master role in one piconet and the slave role in another.

At any given time, data can be transferred between the master and one other device. The master chooses which slave device to address; typically, it switches rapidly from one device to another in a round-robin fashion. Since it is the master that chooses which slave to address, whereas a slave is supposed to listen in each receive slot, being a master is a lighter burden than being a slave. Being a master of seven slaves is possible; being a slave of more than one master is difficult. The specification is vague as to required behavior in scatternets.

2.8.2 Uses

Bluetooth is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device. Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a quasi optical wireless path must be viable. Range is power-class-dependent, but effective ranges vary in practice; see the table on the right.

2.8.3 Application

Wireless control of and communication between a mobile phone and a handsfree headset. This was one of the earliest applications to become popular. Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.Wireless control of and communication with tablets and speakers such as iOS and Android devices.Wireless Bluetooth headset and Intercom. Idiomatically, a headset is sometimes called "a Bluetooth". Wireless streaming of audio to headphones without communication capabilities. Wireless networking between PCs in a confined space and where little bandwidth is required.Wireless communication with PC input and output devices, the most common being the mouse, keyboard and printers.

CHAPTER 3

SOFTWARE DESCRIPTION

3.1 MPLAB

3.1.1 Introduction

The **MPLAB** series of devices are programmers and debuggers for Microchip PIC and dsPIC microcontrollers, developed by Microchip Technology. The ICD family of debuggers has been produced since the release of the first Flash-based PIC microcontrollers, and the latest ICD 3 currently supports all current PIC and dsPIC devices. It is the most popular combination debugging/programming tool from Microchip.The REAL ICE emulator is similar to the ICD, with the addition of better debugging features, and various add-on modules that expand its usage scope. The ICE is a family of discontinued in-circuit emulators for PIC and dsPIC devices, and is currently superseded by the REAL ICE

MPLAB is a free integrated development environment for the development of embedded applications on PIC and dsPICmicrocontrollers and is developed by Microchip Technology. MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer.

STEPS TO DO PROGRAM IN MPLAB

Open MPLAB IDE v8.56.From the 'Projects' tab, select the first option 'Project Wizard'Click on 'Next' in the welcome window that appears
Select the desired PIC which you need to program or build your project on and click on 'Next'.Select the active tool suite you require; among the list of tool suites given (Usually the HI-TECH Universal tool suite is preferred,if installed)
heck if the Toolsuite contents listed contains a compiler suiting your programming needs("HI-TECH ANSI C Compiler" in the case of a HI-TECH Universal toolsuite) and click 'Next'.Create a new project file at your desired location in the desired name.Take care that the project file is saved in the '*.mcp' format and click 'Next'.In the next window , add any files you desire to add to your new project,if required. else just skip this step by clicking 'Next'.
Now click 'finish' and your new project is created.Now select the 'New' option from the 'File' tab.Select 'Save as' option from the 'File' tab and save the new file in the same folder in which you have created the project by selecting a suitable option from 'save as type'(depending on which type of program you're doing)
Select 'Save as' option from the 'File' tab and save the new file in the same folder in which you have created the project by selecting a suitable option from 'save as type'(depending on which type of program you're doing) Begin programming in the file.

3.1.2 Version used

MPLAB 8.X is the last version of the legacy MPLAB IDE technology, custom built by Microchip Technology in Microsoft Visual C++. MPLAB supports project management, editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB only works on Microsoft Windows. MPLAB is still available from Microchip's archives, but is not recommended for new projects. MPLAB supports the following compilers:MPLAB MPASM Assembler,MPLAB ASM30 Assembler,MPLAB

Compiler for PIC18,MPLAB C Compiler for PIC24 and dsPIC DSCs,MPLAB C Compiler for PIC32 and HI-TECH C

3.1.3 Performance

It provides a new Call Graph for navigating complex code,supports multiple configurations within your projects,supports Multiple Versions of the same compiler,support for multiple Debug Tools of the same type,supports Live Parsing,import existing MPLAB® 8 IDE projects and use either IDE for the same source,supports hyperlinks for fast navigation to declarations and includes,supports Live Code Templates,supports the ability to enter File Code Templates with license headers or template code.MPLAB IDE can Track Changes within your own system using local history.Within MPLAB IDE, a user can configure their own Code Format Style.The latest feature supports block select copy and paste.Some more features include color coding of editor tabs for same projects,tab placement,full file path in editor,project name in file tab.It runs using JRE7 on all supported operating systems.The added action items with support for TODO under assembly ,moved tasks to user defined tasks,integrated store tab for easy perusing and purchasing of available software for download.

3.2 EMBEDDED C

3.2.1 Introduction

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic,multiple distinct memory banks, and basic I/O operations.

3.2.2 Difference between Embedded C and C

In the C standard, a standalone implementation doesn't have to provide all of the library functions that a hosted implementation has to provide. The C standard doesn't care about embedded, but vendors of embedded systems usually provide standalone implementations with whatever amount of libraries they're willing to provide. C is a widely used general purpose high level programming language mainly intended for system programming .Embedded C is an extension to C programming language that provides support for developing efficient programs for embedded devices.It is not a part of the C language. Though C and embedded C appear different and are used in different contexts, they have more similarities than the differences. Most of the constructs are same; the difference lies in their applications.C is used for desktop computers, while embedded C is for microcontroller based applications. Accordingly, C has the luxury to use resources of a desktop PC like memory, OS, etc. While programming on desktop systems, we need not bother about memory. However, embedded C has to use with the limited resources (RAM, ROM, I/Os) on an embedded processor. Thus, program code must fit into the available program memory. If code exceeds the limit, the system is likely to crash. Compilers for C (ANSI C) typically generate OS dependant executables. Embedded C requires

compilers to create files to be downloaded to microcontrollers/microprocessors where it needs to run. Embedded compilers give access to all resources which is not provided in compilers for desktop computer applications.Embedded systems often have the real-time constraints, which is usually not there with desktop computer applications.Embedded systems often do not have a console, which is available in case of desktop applications.So, what basically is different while programming with embedded C is the mindset; for embedded applications, we need to optimally use the resources, make the program code efficient, and satisfy real time constraints, if any. All this is done using the basic constructs, syntaxes, and function libraries of 'C'.

3.2.3 Advantages

It is small and simpler to learn, understand, program and debug.Compared to assembly language, C code written is more reliable and scalable, more portable between different platform.C compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'.It is fairly efficient.It supports access to I/O and provides ease of management of large embedded projects.Java is also used in many embedded systems but Java programs require the Java Virtual Machine (JVM), which consumes a lot of resources. Hence it is not used for smaller embedded devices. Two salient features of Embedded Programming are code speed and code size. Code speed is governed by the processing power, timing constraints,

whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum features in minimum space and minimum time.Other mid level language like Pascal, FORTRAN also provide some of the advantages.

CHAPTER 4

CONCLUSION

In this detection system the modules used acquire low power ,and low cost and are easy to interface.The electrodes are placed on the muscles and thus the output is displayed as pulse rate 73 to 75 for normal . In case of any movement the output value reduces completely to 0 and then again comes to normal value which is the indication.This similar method is done by deep tissue detection to diagnose pulmonary edema.The output is obtained as a digital value and in case of analog we can display in DSO .In that case similar,two sets of waveforms can be obtained for normal and abnormal conditions.This system can be implemented in home.

CHAPTER 5

FUTURE SCOPE

As an initial stage, to transfer the data to the android application here we have used Bluetooth which can be used for short distance transmission of range 10-15 meters.Further to develop the distant communication we can wireless which can be used for longer distances and will be more absolute and helpful.

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