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BODY TO BODY COMMUNICATION IN MEDICAL APPLICATION USING REDTACTON WITH IOT

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ABSTRACT: Nowadays people can easily keep track of their health and fitness with human assistive wearable technology .In every individual's life, today health care market has become one of the important issues. New technologies and various instruments are been developed to improve the monitoring systems. Diagnosis and treatment are majorly dependent on monitoring information. We are presents a new concept of communication method called as Body-to-body communication in biomedical field. Human body is used as a medium of transmission of data. The use of this technology in medical monitoring systems eliminates the complexity of existing technologies that involves cables, wires for transmission of data. Applications of wireless body area networks (WBANs) are extended from remote health care to military, sports, disaster relief, etc. With the network scale expanding, nodes increasing, and links complicated, a WBAN evolves to a body-to-body network.

INTRODUCTION

In every individual's life, today health care market has become one of the important issues. New technologies and various instruments are been developed to improve the monitoring systems. Diagnosis and treatment are majorly dependent on monitoring information. Existing systems uses cables and wires to measure health related parameters like temperature, blood pressure, heart rate, etc. this makes the patient very uncomfortable and immovable. This especially increases the complexity in case of long term emergency and risk patients. The monitoring devices receive data through sensors. Various sensors are emerging to monitor Electrocardiogram (ECG), body temperature, pulse oximetry (Sp02), electroencephalography (EEG) and blood pressure for monitoring of emergency and risk patients. Till date, existing system uses wired technology to interconnect between sensors and monitoring systems. This makes the patient feel uncomfortable and unable to move freely. The aim is to reduce the complexity by replacing wired network with wireless technology. Wireless technologies such as WLAN, Bluetooth, etc. will make the patients free, mobile and comfortable. This also simplifies complex surgical and medical treatment monitoring and database can be generated and stored. The capacity of a single sensor to generate data is small in the range of few Kbit/s for monitoring of biological signals. A very huge number of sensors are required to enhance the data rate to few hundreds to thousands of Kbit/s. Existing systems uses cables and wires to measure health related parameters like temperature, blood pressure, heart rate, etc. this makes the patient very uncomfortable and immovable. Till date, existing system uses wired technology to interconnect between sensors and monitoring.

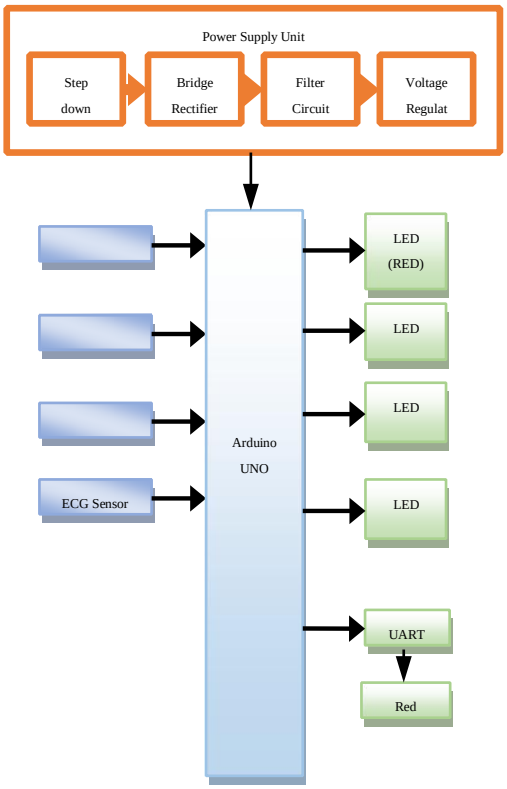
PROPOSED SYSTEM

In proposed system WBAN is proposed based on the requirement of remote medical treatment. In this system sensor is implemented in a body or wearable sensors on a body can monitor physiological states. In the transmitter unit we are using sensor like Heart rate sensor, Humidity sensor, Respiratory sensor and ECG sensor by using these sensor we measure the physical condition of patient. These sensors send the collected data to the Microcontroller and after that through UART to Red Tacton. In a monitoring unit we are using LCD Display to Display the condition and data of patient. LCD attach with the microcontroller which send all the data to hospitals or medical centers through UART and Red Tacton. Each WBAN consists of an android mobile node collecting live data from on-body Shimmer. Sensors record and transmit their data to monitoring devices. Eventually, the data is transferred from one central link sensor to a hospital access point.

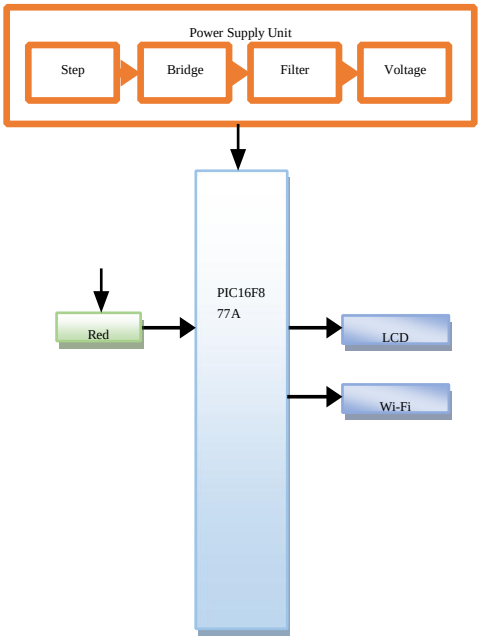
EXISTING SYSTEM

In the Existing systems are uses cables and wires to measure health related parameters like temperature, blood pressure, heart rate, etc. this makes the patient very uncomfortable and immovable. Due to this especially increases the complexity in case of long term emergency and risk patients. Along with the development, energy saving and data security problems are Highlighted. This especially increases the complexity in case of long term emergency and risk patients. The monitoring devices receive data through sensors. New technologies and various instruments are been developed.

BLOCK DIAGRAM – TRANSMITTING UNIT



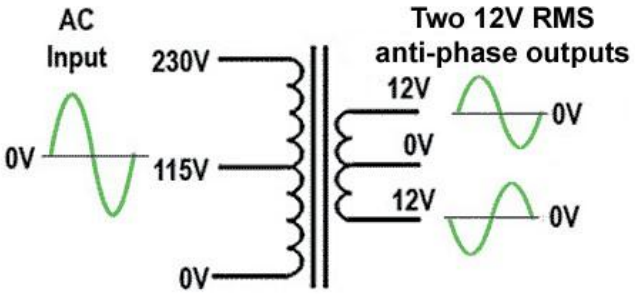
BLOCK DIAGRAM – RECEIVING UNIT



POWER SUPPLY UNIT:

STEP DOWN TRANSFORMER

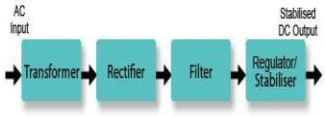
Basic power supply the input power transformer has its primary winding connected to the mains (line) supply. A secondary winding, electro-magnetically coupled but electrically isolated from the primary is used to obtain an AC voltage of suitable amplitude, and after furtherprocessing by the PSU, to drive the electronics circuit it is to supply.The transformer stage must be able to supply the current needed. If too small a transformer is used, it is likely that the power supply's ability to maintain full output voltage at full output current will be impaired. With too small a transformer, the losses will increase dramatically as full load is placed on the transformer. As the transformer is likely to be the most costly item in the power supply unit, careful consideration must be given to balancing cost with likely current requirement. There may also be a need for safety devices such as thermal fuses to disconnect the transformer if overheating occurs, and electrical isolation between primary and secondary windings, for electrical safety.

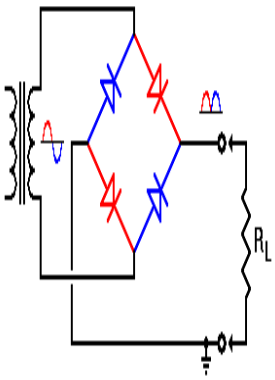


THE RECTIFIER STAGE

Rectifier circuit is used, to convert the AC input is converted to DC. The full wave bridge rectifier uses four diodes arranged in a bridge circuit to give full wave rectification without the need for a center-tapped transformer. An additional advantage is that, as two diodes are conducting at any one time, the diodes need only half the reverse breakdown voltage capability of diodes used for half and conventional full wave rectification. It can be seen that on each half cycle, opposite pairs of diodes conduct, but the current through the load remains in the same polarity for both half cycles.

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.





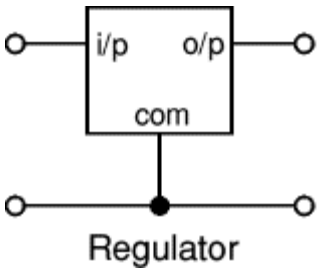
FILTER

A typical power supply filter circuit can be best understood by dividing the circuit into two parts, the reservoir capacitor and the low pass filter. Each of these parts contributes to removing the remaining AC pulses, but in different ways.Electrolytic capacitor used as a reservoir capacitor, so called because it acts as a temporary storage for the power supply output current. The rectifier diode supplies current to charge a reservoir capacitor on each cycle of the input wave. The reservoir capacitor is large electrolytic, usually of several hundred or even a thousand or more microfarads, especially in mains frequency PSUs. This very large value of capacitance is required because the reservoir capacitor, when charged, must provide enough DC to maintain a steady PSU output in the absence of an input current; i.e. during the gaps between the positive half cycles when the rectifier is not conducting.

The action of the reservoir capacitor on a half wave rectified sine wave. During each cycle, the rectifier anode AC voltage increases towards Vpk. At some point close to Vpk the anode voltage exceeds the cathode voltage, the rectifier conducts and a pulse of current flows, charging the reservoir capacitor to the value of Vpk. Once the input wave passes Vpk the rectifier anode falls below the capacitor voltage, the rectifier becomes reverse biased and conduction stops. The load circuit is now supplied by the reservoir capacitor alone.

Of course, even though the reservoir capacitor has large value, it discharges as it supplies the load, and its voltage falls, but not by very much. At some point during the next cycle of the mains input, the rectifier input voltage rises above the voltage on the partly discharged capacitor and the reservoir is recharged to the peak value Vpk again.

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and current.



ARDUINO

An Arduino is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005.

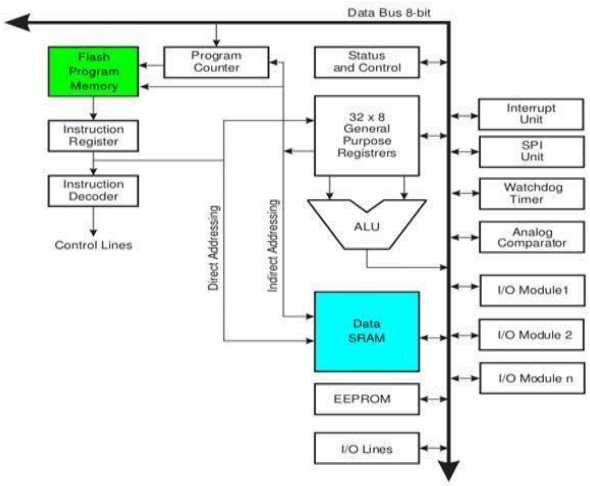
The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The most important advantage with Arduino is the programs can be directly loaded to the device without requiring any hardware programmer to burn the program. This is done because of the presence of the 0.5KB of Bootloader which allows the program to be burned into the circuit. All we have to do is to download the Arduino software and writing the code

ARDUINO ARCHITECTURE

Arduino's processor basically uses the Harvard architecture where the program code and program data have separate memory. It consists of two memories- Program memory and the data memory.The code is stored in the flash program memory, whereas the data is stored in the data memory. The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the bootloader), 2 KB of SRAM and 1 KB of EEPROM and operates with a clock speed of 16MHz.



POWER JACK

Arduino can be power either from the pc through a USB or through external source like adaptor or a battery. It can operate on a external supply of 7 to 12V. Power can be applied externally through the pin Vin or by giving voltage reference through the IORef pin.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

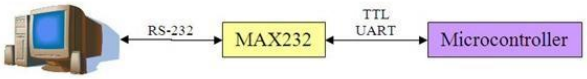
DIGITAL INPUTS

It consists of 14 digital inputs/output pins, each of which provide or take up 40mA current. Some of them have special functions like pins 0 and 1, which act as Rx and Tx respectively , for serial communication, pins 2 and 3-which are external interrupts, pins 3,5,6,9,11 which provides pwm output and pin 13 where LED is connected. It has 6 analog input/output pins, each providing a resolution of 10 bits. It provides reference to the analog inputs.It resets the microcontroller when low.

UART

The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. UART is also a common integrated feature in most microcontrollers. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes.

Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. Communication can be "full duplex" (both send and receive at the same time) or "half duplex" (devices take turns transmitting and receiving).



UART

(Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached serial devices. Specifically, it provides the computer with the RS-232C Data Terminal Equipment (DTE) interface so that it can "talk" to and exchange data with modems and other serial devices.

THE ASYNCHRONOUS RECEIVING AND TRANSMITTING PROTOCOL

Asynchronous transmission allows data to be transmitted without the sender having to send a clock signal to the receiver. In this case, the sender and receiver must agree on timing parameters (Baud Rate) prior transmission and special bits are added to each word to synchronize the sending and receiving units. In asynchronous transmission, the sender sends a Start bit, 5 to 8 data bits (LSB first), an optional Parity bit, and then 1, 1.5 or 2 Stop bits.

When a word is passed to the UART for asynchronous transmissions, the Start bit is added at beginning of the word. The Start bit is used to inform the receiver that a word of data is about to be send, thereby forcing the clock in the receiver to be in sync with the clock in the transmitter.

After the Start bit, the individual bits of the word of data are sent, beginning with the Least Significant Bit (LSB). When data is fully transmitted, an optional parity bit is sent to the transmitter.

ECG

When cell membranes in the heart depolarize, voltages change and currents flow. Because a human can be regarded as a bag of salt water and in other words, a volume conductor changes in potential are transmitted throughout the body, and can be measured. When the heart depolarises, it's convenient to represent the electrical activity as a dipole a vector between two point charges. Remember that a vector has both a size and a direction. By looking at how the potential varies around the volume conductor, one can get an idea of the direction of the vector. This applies to all intra-cardiac events, so we can talk about a vector for P waves, the QRS complex, T

waves. In order to be able to record myocardial activity, the electrocardiograph needs to be able to detect tiny changes in potential on the body surface. We are talking about signals that are often around 1mV, and may be smaller. In addition, we need some reference point to which we relate the potential changes.

PAPER

ECG paper is traditionally divided into 1mm squares. Vertically, ten blocks usually correspond to 1 mV, and on the horizontal axis, the paper speed is usually 25mm/s so one block is 0.04s. Note that we also have big blocks which are 5mm on their side.

Always check the calibration voltage on the right of the ECG, and paper speed. The following image shows the normal 1mV Note that if the calibration signal is not "squared off" then the ECG tracing is either over or under-damped, and should not be trusted.

HEART RATE

Knowing the paper speed, it's easy to work out heart rate. It's also very convenient to have a quick way of eyeballing the rate, and one method is as follows:

1. Remember the sequence: 300, 150, 100, 75, 60, 50 2. Identify an R wave that falls on the marker of a `big block' 3. Count the number of big blocks to the next R wave.

If the number of big blocks is 1, the rate is 300, if it's two, then the rate is 150, and so on. Rates in between these numbers are easy to `interpolate'.

But always remember that in the heart, because we have two electrically `isolated' chambers, the atria and ventricles, that we are really looking at two rates --- the atrial and ventricular rates! It just so happens that in the normal heart, the two are linked in a convenient 1:1 ratio, via normal conduction down the AV node. In disease states, this may not be the case. Liquid crystal cell displays (LCDs) used to display of display of numeric and alphanumeric characters in dot matrix and segmental displays. They are all around us in laptop computers, digital clocks and watches, microwave, CD players and many other electronic devices. LCDs are common because they offer some real advantages over other display technologies.

An LCD is made with either a passive matrix or an active matrix display grid. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active matrix display can be switched on and off more frequently, improving the screen refresh time. Passive matrix LCD's have dual scanning, meaning that they scan the grid twice with current in the same

WORKING

When sufficient voltage is applied to the electrodes the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating/highlighting the desired characters. The power supply should be of +5v, with maximum allowable transients of 10mv. To achieve a better/suitable contrast for the display the voltage at pin 3 should be adjusted properly. The ground terminal of the power supply must be isolated properly so that voltage is induced in it. The module should be isolated properly so that stray voltages are not induced, which could cause a flicking display. LCD is lightweight with only a few, millimeters thickness since the LCD consumes less power, they are compatible with low power electronic circuits, and can be powered for long durations.

This display structure is unwieldy for more than a few display elements. Small monochrome displays such as those found in personal organizers, or older laptop screens. The pixels are addressed one at a time by row and column addresses. This type of display is called passive-matrix addressed because the pixel must retain its state between refreshes without the benefit of a steady electrical charge. As the number of pixels increases, this type of display becomes less feasible. Very slow response times and poor contrast are typical of passive matrix addressed LCDs. High-resolution color displays such as modern LCD computer monitors and televisions use an active matrix structure. A matrix of thin-film transistors (TFTs) is added to the polarizing and color filters. Each pixel has its own dedicated transistor, allowing each column line to access one pixel. When a row line is activated, all of the column lines are connected to a row of pixels and the correct voltage is driven onto all of the column lines. The row line is then deactivated and the next row line is activated. All of the row lines are activated in sequence during a refresh operation. Active-matrix addressed displays look "brighter" and "sharper" than passive-matrix addressed displays of the same size, and generally have quicker response times, producing much better images. A general purpose alphanumeric LCD, with two lines of 16 characters. So the type of LCD used in this project is16 characters * 2 lines with 5*7 dots with cursor, built in controller, +5v power supply, 1/16 duty cycle.

RESULTS

Here the correct password key is transmitted from the Red Tacton transmitter to the receiver through the human body and then the data transmits to the pic controller from

where the data that is password can be displayed on the LCD connected to the pic. When a relay is connected to the pic controller the signal will be transmitted to the relay which in turn rotates the dc motor attached to the vehicle. It is just a prototype where we have used the Intra body communication for giving authentication for a vehicle. But in real time it can be adopted for authentication of valuable military devices like in gun and missile launchers where the user who has the Red Tacton transmitter kit can alone access those devices with Red Tacton receiver kit of matched frequencies. Also used for transmitting data with high security between the military personnel when they just make a physical touch between them.

CONCLUSION

Since Red Tacton uses a property of photonic electro-optic crystal, it has many advantages over other technologies in terms of communication distance, data transfer rate, and the interaction. A major advantage is that the data transferred through this technology cannot be hacked. A big achievement is obtained in the field of medical application and security applications with the help of invention of Red Tacton technology. If Red Tacton is introduced in the world of the cybermarket, then it will bring tremendous revolution as it can eliminate the cybercrime. There no danger to the human body from electric signals and other radiations created by this technology because the human electric field is the medium to transfer the data. As discussed above, Red Tacton has a clear edge over the other technologies, so we can say that the Red Tacton will be the step for future developments

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