A SECURE MOBILE HEALTHCARE SYSTEM USING FINGERPRINT BASED MODEL

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ABSTRACT: Due to the introduction of telecommunication technologies in telemedicine services, the expeditious development of wireless and mobile networks has stimulated wide applications of mobile electronic healthcare systems. However, security is an essential system requirement since many patients have privacy concerns when it comes to releasing their personal information over the open wireless channels. For this reason, this study discusses the characteristics and security issues with wireless and pervasive data communications for a ubiquitous and mobile healthcare system which consists of a mobile devices and sensors attached to a patient. These devices form a mobile network and collect data that are sent to the hospital or healthcare center for monitoring. Subsequently, this paper discusses the innovation and design of a fingerprint based evaluation model. The propose of a secure fingerprint based model that employs trust in order to evaluate the behavior of each node, so that only trustworthy nodes are allowed to participate in communications, while the misbehavior of malicious nodes is effectively prevented. Then we analyze the security properties of our fingerprint based scheme and evaluate its performance based on simulation experiments. So our experimental results demonstrate that our scheme not only achieves the necessary data transmission in mobile environments, but it also provides more security with reasonably little additional overhead.

INTRODUCTION

Due to the introduction of telecommunication technologies in telemedicine services, the expeditious development of wirelessandmobilenetworks has stimulated wide applications of mobile electronic healthcare systems. However, security is an essential system requirement since many patients have privacy concerns when it comes to releasing their personal information over the open wireless channels.

For this reason, this study discusses the characteristics and security issues with patient identification and pervasive data communications for a ubiquitous and mobile healthcare system which consists of a number of mobile devices andsensors attached to a patient. These devices form a mobile ad hoc sensornetworkand collect data that are sent to a hospital or healthcare center formonitoring.

In this project we are designing a system in which the patients data will be fed to the PC based server including his thumb print template. Before the data is fed into the sensor node the security feature is enabled and the data logging will start only after the patients finger print matches to the pre existing template.

Subsequently, this project discusses the innovation and design of a novel trust evaluation model. We then propose a secure multicast strategy that employs trust in order to evaluate the behavior of each node, so that only trustworthy nodes are allowed to participate in communications, while the misbehavior of malicious nodes is effectively prevented. We analyze the security properties of our multicast scheme and evaluate its performance based on simulation experiments. Our experimental results demonstrate that our scheme not only achieves the necessary data transmission in mobile environments, but also provides more security with reasonably little additional overhead.

LITERATURE REVIEW:-

Mobile healthcare services have the potential to becomeintegral components of a modern healthcare system, as theycan provide alternative solutions to numerous medical and social requirements. These mobile devices and fingerprint based model work in a very different manner than conventional medical equipment.

Bulut Altıntaş , Tacha Serif, Department of Computer Engineering, Yeditepe University Istanbul, Turkey baltintas@cse.yeditepe.edu.trin their paper published “Location-aware Patient Record Access: Patient Identification Using Fingerprinting Technique” In this paper describes a location-aware electronic health record system that can sense the location of the physician byutilizing fingerprinting technique, and retrieve the relevant patient’s medical data on to thephysician’s mobile device. Furthermore, the system also enables medical personnel to transcribe post-it-like, audio-notes, and facilitate communication among physicians on other shifts by posting location-based notes. The prototype system’s location precision and usability evaluation results indicate that the proposed system is conceived as easy to use, accurate, and efficient tool.

Daojing He, Chun Chen, Sammy Chan, Jiajun Bu, and Athanasios V. Vasilakos I their paper published “A Distributed Trust Evaluation Model and Its Application Scenarios for Medical Sensor Networks” In this paper we identify the unique features of MSNs and introduce relevant node behaviors, such as transmission rate and leaving time, into trust evaluation to detect malicious nodes. We then propose an application-independent and distributed trust evaluation model for MSNs. The trust management is carried out through the use of simple cryptographic techniques. Simulation results demonstrate that the proposed model can be used to effectively identify malicious behaviors and thereby exclude malicious nodes. This paper also reports the experimental results of the Collection Tree Protocol with the addition of our proposed model in a network of TelosB motes, which show that the network performance can be significantly improved in practice. Further, some suggestions are given on how to employ such a trust evaluation model in some application scenarios.

P. Raga Lavima1, G. Subhramanya Sarma2 Student (M.Tech) 1, Asst professor2 Department of Electronics and Communication Engineering Lingayas institute of management and technology, Vijayawadatheir paper published “ An IOT Based Intelligent Medicine Box ” in this paper gives an experimental idea of patient’s health condition and monitor environmental conditions and controlling. The platform involves an open-platform-based intelligent medicine box with enhanced connectivity and interchange ability for the integration of devices and services, Intelligent pharmaceutical packing with communication capability enabled by Zigbee and actuation capability enabled by functional materials and, flexible and wearable bio-medical sensor device enabled.

Marc Alexander Kowtko , Seidenberg School of Computer Science and Information Systems , Pace University 861 Bedford Road, Pleasantville, NY 10570 “Biometric Authentication for Older Adults” in this paper gives In recent times, cyber-attacks and cyber warfare have threatened network infrastructures from across the globe. The world has reacted by increasing security measures through the use of stronger passwords, strict access control lists, and new authentication means; however, while these measures are designed to improve security and Information Assurance (IA), they may create accessibility challenges for older adults and people with disabilities. Studies have shown the memory performance of older adults decline with age. Therefore, it becomes increasingly difficult for older adults to remember random strings of characters or passwords that have 12 or more character lengths. How are older adults challenged by security measures (passwords, CAPTCHA, etc.) and how does this affect their accessibility to engage in online activities or with mobile platforms? While username/password authentication, CAPTCHA, and security questions do provide adequate protection; they are still vulnerable to cyber-attacks.

BLOCK DIAGRAM & DESCRIPTION

2.1 Block Diagram of system:-

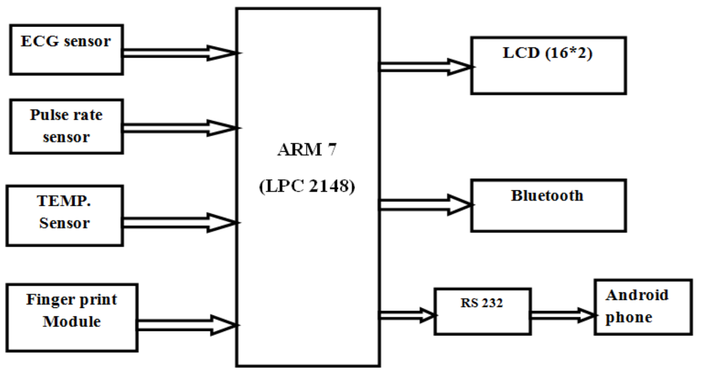


Fig:-Block Diagram of Secure Mobile Healthcare System Using Fingerprint Based Model.

❖ **Microcontroller: ARM 7 (LPC 2138)**

The ARMv7-A and ARMv7-R instruction set architecture, ARM architecture. An ARM processor is one of a family of CPUs based on the RISC (reduced instruction set computer) architecture developed by Advanced RISC Machines (ARM).

ARM makes 32-bit and 64-bit RISC multi-core processors. RISC processors are designed to perform a smaller number of types of computer instructions so that they can operate at a higher speed, performing more millions of instructions per second (MIPS). By stripping out unneeded instructions and optimizing pathways, RISC processors provide outstanding performance at a fraction of the power demand of CISC (complex instruction set computing) devices.

ARM processors are extensively used in consumer electronic devices such as smartphones, tablets, multimedia players and other mobile devices, such as wearable’s. Because of their reduced instruction set, they require fewer transistors, which enables a smaller die size for the integrated circuitry (IC). The ARM processor’s smaller size reduced complexity and lower power consumption makes them suitable for increasingly miniaturized devices.

ARM processor features include:

- Load/store architecture.
- An orthogonal instruction set.
- Mostly single-cycle execution.
- Enhanced power-saving design.
- 64 and 32-bit execution states for scalable high performance.
- Hardware virtualization support.

The simplified design of ARM processors enables more efficient multi-core processing and easier coding for developers. While they don't have the same raw compute throughput as the products of x86 market leader Intel, ARM processors sometimes exceed the performance of Intel processors for applications that exist on both architectures.

❖ **Finger Print Module:**

Finger print module is interfaced with the microcontroller. This module is used to identify the finger prints of human being. The finger print module uses a sensor which identifies the human finger and stores the data in the form of 32 bit data frame. Figure print module is interfaced with the microcontroller via rs232 standard. The figure print module can be commanded by microcontroller using its standard commands. Using these standard figure print module commands we can register the user, check (compare) and delete the user from this module.

❖ **Liquid Crystal Display:**

LCD is used in a project to visualize the output of the application. We have used 16x2 lcd which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD.LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

❖ **Temperature Sensor:**

Temperature sensors are used to sense the temperature. We have used a Temperature sensor called LM35. This temperature sensor can sense the temperature of the atmosphere around it, the temperature of any machine to which it is connected or even can give the temperature of the human body in case if used. So irrespective of the application to which it is used andit gives the reading of the temperature. The LM35 series are precision integrated-circuit temperature sensors and whose output voltage is linearly proportional tothe Celsius (Centigrade) temperature.

Temperature sensor is an analog sensor, gives the output into form of analog signal. This signal is feed to ADC which will convert it into digital form. Once converted into analog form and the microcontroller can process the digital.

❖ **Pulse Rate Sensor:**

The pulse rate sensor is basically used to keep track on the pulse rate of the person. In programming the maximum, the minimum points are provided for the pulse rate. If the pulse rate goes below or above the set point then the alert will be immediately issued by the microcontroller.

❖ **Bluetooth:**

Bluetooth is a wireless technology it is used for shearing data over the short distancefrom fixed, mobile devices and building personal area networks (PANs). It can connect several devices for overcoming problems of synchronization.

The Android platform includes support for the Bluetooth network stack, which allows a device to exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIS. These APIS let applications connect to other Bluetooth devices, enabling point-to-point and multipoint wireless features.

Using the Bluetooth APIS an Android application can perform the following:

- Scan for other Bluetooth devices
- Query the local Bluetooth adapter for paired Bluetooth devices
- Establish RFCOMM channels
- Connect to other devices through service discovery
- Transfer data to, from other devices
- Manage multiple connections

❖ **ECG:**

The ECG gives Anatomy, function of the heart. The heart serves as a four-chambered pump for the body's blood circulatory system. The four chambers are names as: left atrium, left ventricle, right atrium and right ventricle.

The normal ECG waveform:-

The following figure shows two complete cycles of a normal ECG waveform.

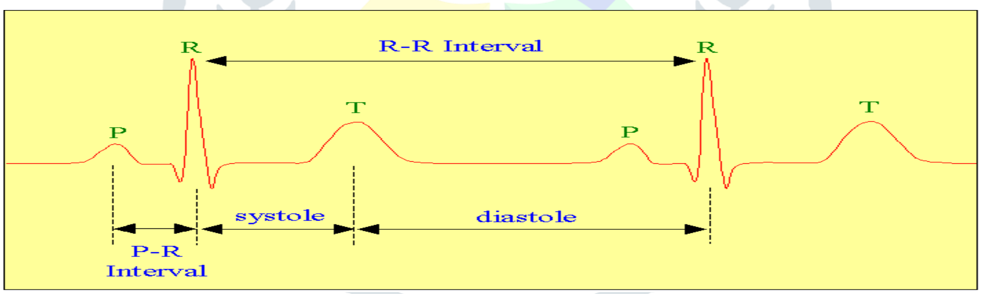


Fig 2.2: Normal ECG waveform.

P-wave is produced by muscle contraction of atria.

R-wave marks the ending of atria contraction, the beginning of ventricular contraction. Finally**T-wave** marks the ending of ventricular contraction. The magnitude of the R-wave normally ranges from 0.1 mV to 1.5 mV. A narrow, high **R-wave** indicates a physically strong heart. The **R-R interval** measures the period of heart beat.

❖ **RS 232:**

RS 232 is a serial communication cable used in the system. Here the RS 232 provides the serial communication between the microcontroller, the outside world such as display and PC or Mobile etc. So it is a media used to communicate between microcontroller and the PC.In our project the RS232 serves the function to transfer the edited notice (or data) from PC (VB software) to the microcontroller and for the further operation of the system.

❖ **Power Supply:**

All electronic circuits use DC power supply of adequate voltage for their operation. To obtain this DC voltage from 230V AC mains and we need to use a 'rectifier'. The rectified DC voltage is 'pulsating' in nature. We know that a combination of rectifier, filter can produce a dc voltage which is almost pure i.e. ripple free. However the problem with such a power supply is that its output voltage will not remain constant in the event of fluctuations in ac input voltage or changes in load current. This type of power supply is called as unregulated power supply. The power supply and which provides a constant output voltage irrespective of everything is called and regulated power supply. So we have to design a regulated power supply using series voltage regulator IC 7805.Following figure shows general block diagram of regulated power supply.

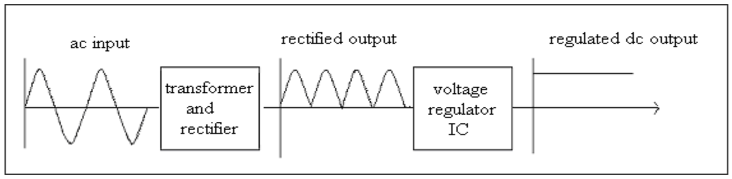


Fig:- General Block Diagram of Power Supply

❖ Types of Power Supply

Power supply have many types. Most power supply are designed to convert high voltage AC to a suitable low voltage supply andother devices. A power supply can by broken down into a series of blocks,each of which performs a particular function. For example a 5V regulated supply:

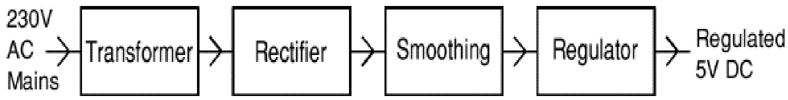
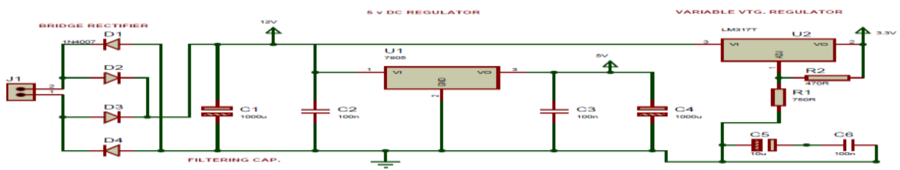


Fig:-Block Diagram of a Regulated Power Supply

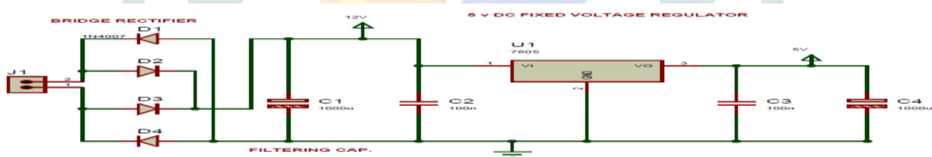
Each of the blocks is described in more detail below:



❖ 5V SUPPLY DESIGN:

The basic step in the designing of any system is to design the power supply required for that system. The steps for designing power supply is given below,

- Determine the total current that the system sinks from the supply.
- Determine the voltage rating required for the different components.



The bridge rectifier, capacitor input filter produce an unregulated DC voltage which is applied at the input of 7805.As the minimum dropout voltage is 2v for IC 7805 and the voltage applied at the input terminal should be at least 7 volts.C1 (1000 µf / 65v)is the filter capacitor and C2, C3 (0.1 PF) is to be connected across the regulator to improve the transient response of the regulator.Assuming the drop out voltage to be 2 volts and the minimum DV voltage across the capacitor C1 should be equal to 7volts (at least).

❖ Power supply design of the Project:

The average voltage at the output of a bridge rectifier capacitor filter combination is given by

$V_{in}(DC) = V_m – I_{dc} / 4 f C1$

Where, $V_m=\sqrt{2}\, V_s$ and V_s = rms secondary voltage

Assuming Idc to be equal to max. Load current, say 100mA

C = 1000 GF / 65v, f=50Hz

$19 = V_m – 0.1 / 4*50*1000*10^{-6}$

$19= V_m – 0.1 / 0.2$

$V_m=19.5$ volts

Hence the RMS secondary Voltage

$V_{rms} = v_m / \sqrt{2} = 19.5 / \sqrt{2}$

$=19.5 / 1.4421$

$V_{rms} =13.5$ volts

So we can select a 15v secondary Voltage

In our system most of the components used require 5 V as operating voltage such as microcontroller, MAX 232 and MCT2E etc. The total current and which our circuit sinks from the power supply and is not more than 100 mA. We have used Regulator IC 7805 that gives output voltage of 5V.The minimum input voltage required for the 7805 is near about 7V. Therefore we have used the transformer with the voltage rating 230v-10v and current rating 500 mA. The output of the transformer is 12 V AC. This Ac voltage is converted into 12 V DC by Bridge rectifier circuit.

The reasons for choosing the bridge rectifier are

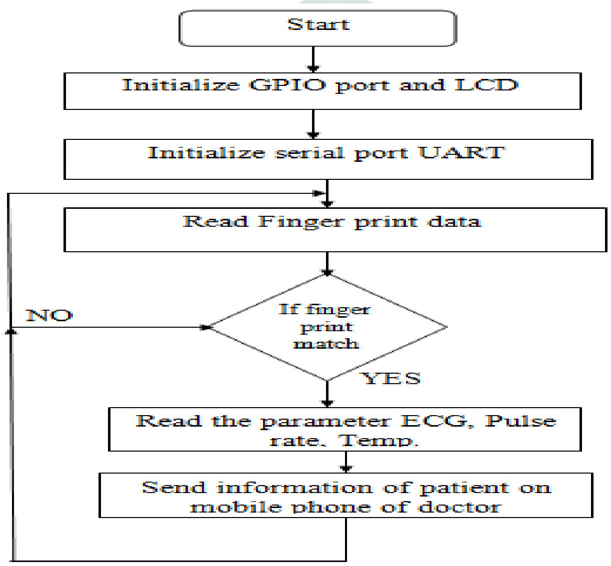
a) The TUF is increased to 0.812 as compared the full wave rectifier.

b) The PIV across each diode is the peak voltage across the load $=V_m$ not $2V_m$ as in the two diode rectifierOutput of the bridge rectifier is not pure DC and contains some AC some AC ripples in it. To remove these ripples we have used capacitive filter and which smoothens the rippled output that we apply to 7805 regulators IC that gives 5V DC. We preferred to choose capacitor filters since it is cost effective and readily available, not too bulky.

3.3 Algorithm

1. Start
2. Initialize the GPIO port and LCD
3. Initialize serial port UART
4. Read finger print data
5. Check finger print data, if matched go to step 5 otherwise step 3
6. Read the parameters ECG, Pulse rate, Temp.
7. Send information of patient on mobile phone of doctor
8. Go to step 3

3.4 Flowchart



Application

1. Hospital
2. Give privacy and security to patient data.
3. Data storage, accessories

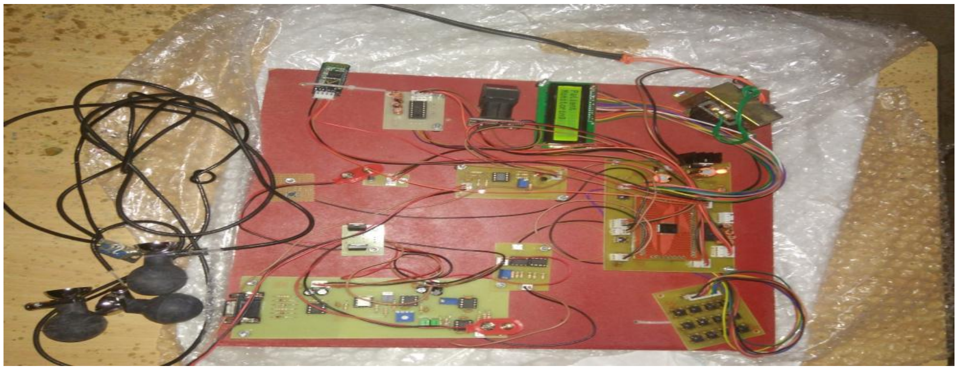
Result

In this system we design the secure mobile healthcare system using fingerprint model. And it gives the security with patient identification, pervasive data communications for a ubiquitous, mobile healthcare system which consists of a number of mobile devices, sensors attached to a patient. The devices form a mobilesensornetworkcollect data that are sent to a hospital or healthcare center formonitoring. In this project we are designing a system in which the patients data will be fed to the PC based server including his thumb print template. Before the data is fed into the sensor node the security feature is enabled the data logging will start only after the patients finger print matches to the pre existing template.

Conclusion

In the increasing development of mobile health care system yields the largest growth among mobile users. The study on mobile healthcare system that describes some issues and facts are focused in related areas. Mobile healthcare alert system that delivers the proper timing and emergency case alerts. The mobility devices that enhance the computation based on the ubiquitous nature. Emergency alerts based on Smartphone's are considered in MANETs which provides the advantageous issues related to power consuming, portability and flexibility. The technology based mobile home care, so patient monitoring system that made cost efficient and quality based on particular patients which reduces transportations related to patients. Multimedia based healthcare system that supports real time interactive application offers message transformation, easy to use and cost effectiveness. A dynamic integration related to multimedia medical data provides the framework which is low overhead and rich multimedia support. The wireless medium develops a wireless emergency healthcare system for an environment that integrates with several technologies such as FINGERPRINT based, RFID, GSM, and GPS. Monitors the location based rapid search for patients, performance related issues are focused. The privacy related issues are focused which provides the authenticated usage by cryptographic mechanism and provable data security. The strong privacy preserving schemes are analyzed which provides the efficient e health system by providing privacy, security.

Result:-



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