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IOT - Assisted ECG Monitoring Framework with Secure Data Transmission for Health Care Applications

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ABSTRACT: Wireless communication is among technologies biggest contribution to mankind. It is enhanced to convey the information quickly to the consumers.In the modern health care environment, the usage of internet of things (IoT) with global system for mobile communication (GSM) bring convenience of physicians and patients.The body sensor networks is one of the core technologies of IoT developments in health care system. IoT and GSM based monitoring system is proposed for continuous monitoring of patients health condition using sensors. This focus on the measurement and monitoring of various biological parameters using web server and android application. Doctor can monitor the patient condition on his/her smart phone.

I. INTRODUCTION

WIRELESS SENSOR NETWORK

A **wireless sensor network** (WSN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control.

II. LITERATURE SURVEY

Connor, Stephen B., Timothy J. Quill, and James R. Jacobs. "Accuracy of drug infusion pumps under computer control." Biomedical Engineering, IEEE Transactions on 39.9 (1992): 980-982.

Infusion rates demanded of the infusion pump in many computer-controlled drug delivery applications are made to change at intervals much shorter than those encountered under routine clinical use. The purpose of this study was to validate the volumetric accuracy of three commercially available infusion pumps operating in a demanding computer-controlled application. Flow rate accuracy of +or-5% is equal to the nominal expected accuracy of these infusion pumps in conventional clinical use.

Sankaranarayanan, Sriram, et al. "A model-based approach to synthesizing insulin infusion pump usage parameters for diabetic patients." Communication, Control, and Computing (Allerton), 2012 50th Annual Allerton Conference on. IEEE, 2012.

We present a model-based approach to synthesizing insulin infusion pump usage parameters against varying meal scenarios and physiological conditions. Insulin infusion pumps are commonly used by type-1 diabetic patients to control their blood glucose levels. The amounts of insulin to be infused are calculated based on parameters such as insulin-to-carbohydrate ratios and correction factors that need to be calibrated carefully for each patient.

In this paper, we propose to synthesize optimal parameters for meal bolus calculation starting from models of the patient's insulin-glucose regulatory system and the infusion pump.

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Testing of Droplet-Based Microelectrofluidic Systems Fei Su, Sule Ozev, and Krishnendu Chakrabarty
Composite Microsystems that integrate mechanical and fluidic components are fast emerging as the next generation of system-on-chip designs. As these systems become widespread in safety-critical biomedical applications, dependability emerges as a critical performance parameter. In this paper, we present a cost effective concurrent test methodology for droplet-based Microelectrofluidic systems. The measurement sensitivity for different probing conditions is shown experimentally and verified by theoretical analysis. The change in bound power with the number of liquid droplets depositing on unclad fiber.

III. EXISTING SYSTEM

In existing system all the sensors data will be stored send send to the doctor using Zigbee. A Wireless Sensor Network (WSN) for monitoring patient's physiological conditions continuously using Zigbee. Here the physiological conditions of the patient's are monitored by sensors and the output of these sensors is transmitted via Zigbee and the same has to be sent to the remote wireless monitor for acquiring the observed patient's physiological signal Infusion pump is a medical device. It is healthcare facilities used worldwide in hospitals, and at home. It can deliver fluids both in medicines and nutrients such as pain relievers chemotherapy drugs, hormones or insulin, and antibiotics into a patient's body in any amounts. There are many types of pumps including insulin pumps, syringe, large volume, elastomeric, patient-controlled analgesia (PCA), and enteral pump. Enteral pump is a pump that is used to deliver medications and liquid nutrients to a patient's digestive tract. Patient-controlled analgesia (PCA) pump is a pump that is used to deliver pain medication. Insulin pump is a pump that is used to deliver insulin to patients with diabetes which is frequently used in home.

IV. PROPOSED SYSTEM

In the proposed system, the GSM technology is replace with IoT. The IoT technology monitors the patients health and log the data in a cloud storage. Whenever the patient need emergency care, the proposed system alerts the predefined users and also it finds the nearby emergency contacts like ambulance. The IoT technology uses internet to transfer the medical data about the patient continuously. Body Sensor Network (BSN) allows the integration of intelligent, miniaturized low-power sensor nodes in, on or around human body to monitor body functions and the surrounding environment. It has great potential to revolu-tionize the future of healthcare technology and attained a number of researchers both from the academia and industry in the past few years. Generally, BSN consists of in-body and on-body sensor networks. An in-body sensor network allows communication between invasive/implanted devices and base station. On the other hand, an on-body sensor net work allows communication between non-invasive/wearable devices and a coordinator. Now, our BSN-Care BSN architecture composed of wearable and implantable sensors. Each sensor node is integrated with bio-sensors such as Electrocardiogram (ECG), Blood Pressure (BP), etc.Besides, when the LPU detects any abnormalities then it provides immediate alert to the person that wearing the bio-sensors.

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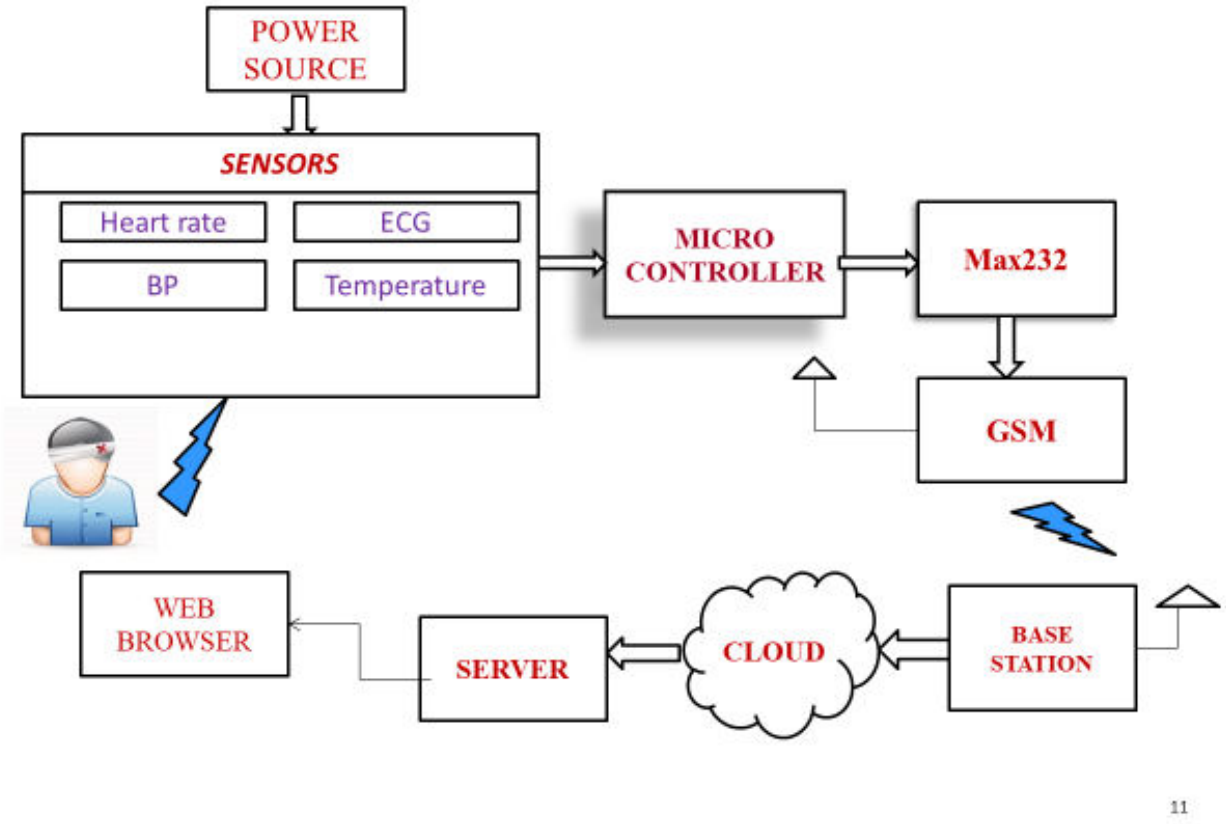
4.1. BLOCK DIAGRAM



V. SYSTEM REQUIREMENTS

1.1. HARDWARE DESCRIPTION

ARDUINO UNO R3 MICROCONTROLLER

The Arduino Uno R3 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 Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board (A000046) has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

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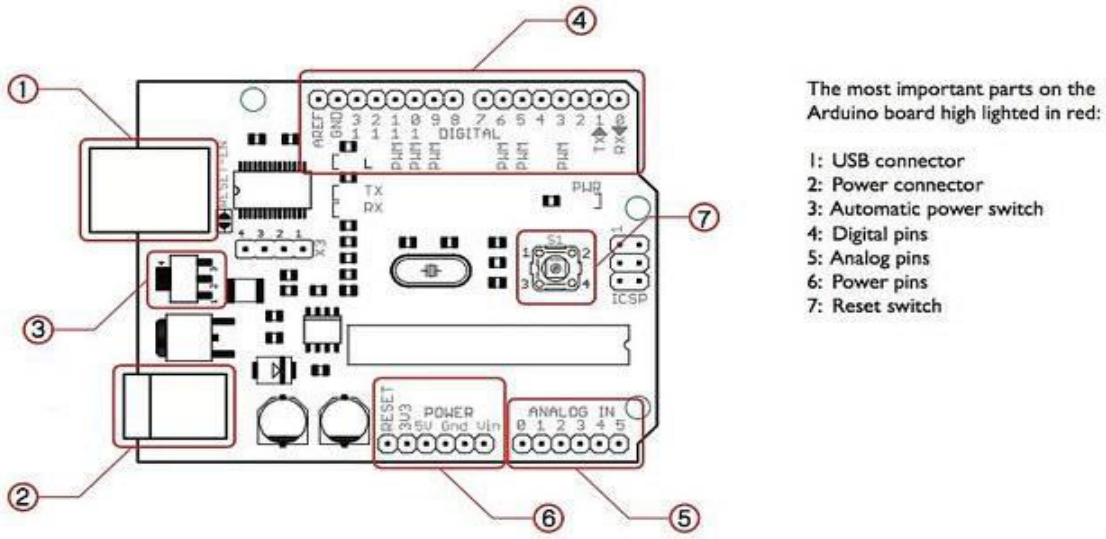

Figure 5.1: Microcontroller

5.22. LCD:

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. 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. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence.

The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome. Liquid crystals were first discovered in 1888. By 2008, worldwide sales of televisions with LCD screens exceeded annual sales of CRT units; the CRT became obsolete for most purposes.

Figure 5.8. LCD Display

5.23.ARDUINO

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU

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Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in pre assembled form, or as do-it-yourself kits.

The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors

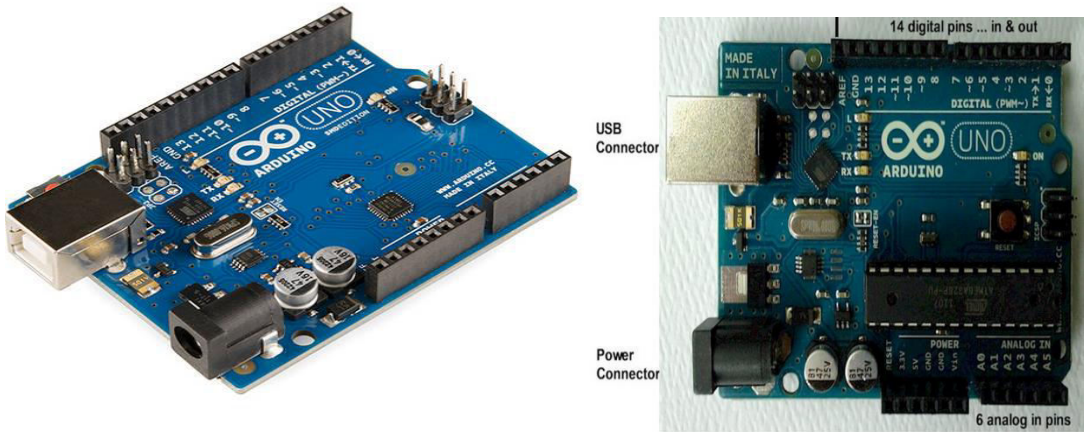

Figure 5.10: Micro controllers and Chips

VI. CONCLUSION

We found that even though most of the popular BSN based research projects acknowledge the issue of the security, but they fail to embed strong security services that could be preserve patient privacy. Finally, we proposed a secure IoT based healthcare system using BSN, called BSN-Care, which can efficiently accomplish various security requirements of the BSN based healthcare system. All the sensor which is connected in the body is used to collect the abnormal symptoms of the human body and then it is collected back to the doctors through the IOT technology.

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