MEDICAL SYSTEM WITH THE USE OF PLETHYSMOGRAPHIC SENSORIN WI-FI NETWORK

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Abstract: This paper presents the performances of a medical system with the use of plethysmographic sensor in Wi-Fi wireless networks. The pulse rate sensor, based on a LED and the conditioning circuit and a temperature sensor and It's parameters are also presented. The integration in Wi-Fi networks is using a development kit (raspberry pi).
Keywords: wifi, Medical, Plethysmographic, sensor.

I. INTRODUCTION

Healthcare is an ideal environment for the use of wireless and mobile computing technologies. From a process perspective, the hospital of today can be compared to a logistical or supply chain operation. There are multiple departments through which the patient moves, while at the same time, critical patient-specific information is needed for real-time decision support. Clinicians must have access to this information at the right time wherever they are without increasing their workload. Healthcare continues to be an important field of study with concerns regarding aging in the western world and possibilities of tele-medicine high on the list of interesting subjects. In order to give access to care to a higher number of patients a possible solution for monitoring at home or through a network is needed. Through the development of equipments for wireless data transmission and through improvements in data processing capabilities as well as the continuous evolution of manufacturing technologies used for medical sensors, objectives that seemed impossible to attain became reality. It is impossible to imagine modern medicine without glucose monitoring devices, ECG, photopletysmographs, etc.[1,4,5,6]

II. THE HARDWARE SYSTEM

A. Raspberry Pi: Developer is Raspberry Pi Foundation. It is Single-board computer Release in February 2012.Operating system Linux (Raspbian, Debian GNU/Linux, Open ELEC, Fedora, Arch Linux ARM, Gentoo), RISC OS, FreeBSD, Net BSD, Plan 9, Inferno, OpenWrt. Power 2.5W(model A),3.5 W (model B)3.0 W (model B+).The Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC),which includes an ARM1176JZF-S 700 MHz processor, Video Core IV PU, and was originally shipped with 256 megabytes of AM, later upgraded (Model B & Model B+) to 512 MB. The system has Secure Digital (SD) or MicroSD (Model A+ and B+) sockets for boot media and persistent storage.

Fig.1: raspberry pi[2]

B. Temperature sensor: The temperature sensor used in this is LM 35DZ,Calibrated directly in Degrees Celcius. It sense the temperature from -40°c to +110°c.It has less than 60µA Current Drain and Low Impedance Output. Linear + 10.0 mV/˚C scale factor.

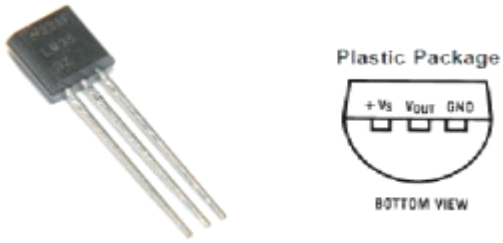

Fig. 2: Temperature Sensor

C. RFID Reader: Radio Frequency Identification (RFID) Card Readers provide a low-cost solution to read passive RFID transponder tags up to 7 cm away. It can be used in a wide variety of hobbyist and commercial applications, including access control, automatic identification, robotics navigation, inventory tracking, payment systems, and car immobilization. The RFID card reader read the RFID tag in range and outputs unique identification code of the tag at baud rate of 9600. The data from RFID reader can be interfaced to be read by microcontroller or PC.

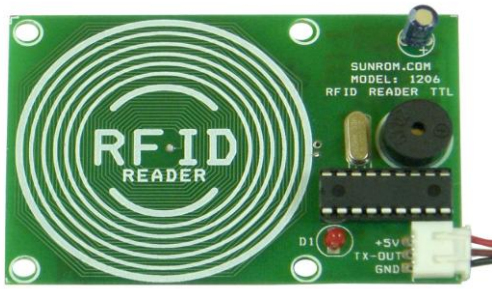

Fig. 3: RFID Reader

D. RFID Tag: The EM4102 (previously named H4102) is a CMOS integrated circuit for use in electronic Read Only RF Transponders. The circuit is powered by an external coil placed in an electromagnetic field, and gets its master clock from the same field via one of the coil terminals. By turning on and off the modulation current, the chip will send back the 64 bits of information contained in a factor programmed memory array. The programming of the chip is performed by laser fusing of polysilicon links in order to store a unique code on each chip. The EM4102 has several metal options which are used to define the code type and data rate. Data rates of 64, 32and 16 periods of carrier frequency per data bit are available. Data can be coded as Manchester, Biphase or PSK. Due to low power consumption of the logic core, no supply buffer capacitor is required. Only an external coil is needed to obtain the chip function. A parallel resonance capacitor of 78 pF is also integrated.

Fig. 4: RFID Tag

E. Heart beat sensor: Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to micro controller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

Fig. 5: Heart Beat Sensor

III. DESIGN OF PROPOSEDHARDWARE SYSTEM

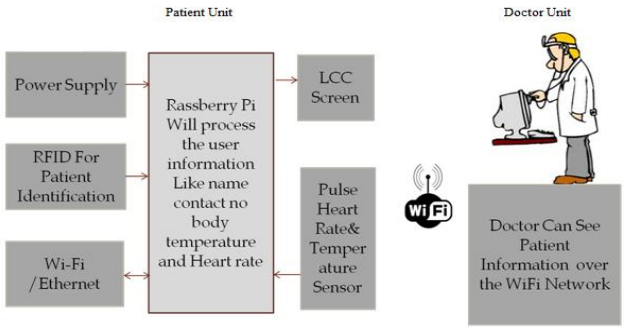

Fig.6 : Block diagram

IV. FLOW OF PROPOSED SYSTEM

The design of entire system consisted of two part which are hardware and software. Hardware is divided in to two parts which are doctor unit and patient unit. The hardware is designed by the rules of embedded system, and the steps of software consisted of three parts. WIFI based wireless technology which consists of transmitter at the site location and receiver at control panel. So the doctor, 0at his cabin, with internet connection can see the received data. The system uses a compact circuitry built ARM1176JZF, Programs are developed in Embedded C. With the help of RFID reader will read the RFID tag. So by doing this patient identification will be done. Now the temperature sensor and pulse sensor will sence the temperature and pulse of the human body respectively. The pulse sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the light must pass through finger and detected at other end. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated on top by a LED which blinks on each heart beat. Each data are transferred to micro-processor. The data will be sent to the port according to the programming is done. All the data will store at internet. At the second hand doctor will get the data through the Wifi. By clicking the link doctor will get the information in text form. In this system the multiple patient's data can be collect at the same time.

V. V.CONCLUSION

The resources of the Ethernet & Wi-Fi network have not been fully used it is possible to send additional information. The system can integrate a sensor to evaluate oxygen concentration in blood, a temperature sensor or a sensor to determine glucose concentration. To evaluate blood oxygen Concentration the described sensor can be modified and a red LED can be used. To decrease traffic it is possible to reduce the sampling period from 100 Hz to as maller frequency, but not smaller than 25 Hz. For a hospital it is possible to implement such a network to cover one or two rooms and from the data collecting point the collected data can be sent further through a wired network.

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