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Intelligent Patient Health Monitoring Over an IOT Environment

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Abstract:
Now, the same day, the healthcare industry is providing better medical care to people anytime, anywhere in the world, more economically and advantageously for patients. In this document we get the physiological parameters of the ECG, the pulse rate and temperatures are driven by the ARM11 processor and are displayed on the LCD screen. If an important parameter comes out of a regular range, the signal will be sent to Doctor Mobile. The system uses a low cost ECG program, a component and a viewer for doctors to monitor, diagnose and treat patients at significantly lower costs, regardless of the patient's location. The system consists of hardware and software components.

Body parameters are processed by the ARM process, it is shown to patients on the LCD display and waveforms of the patient. The same computer data can be examined by two doctors. The first computer, which uses the shared remote desktop, and the second on Android mobile devices that share remote computers, reports that the report shows that this system is a major concern for doctors with a technological hobby and a barrier that remains in use and low cost. and integration into emerging markets. Daily operations The system reduces costs by allowing internal patient control, eliminating the need to use expensive equipment and reducing the need to transport patients, doctors and medical centers. Easy to use and requires no special training as well as knowledge of standard and widespread Internet devices. Through the interactive methodology of the system, doctors can consult directly with the programs provided on a personal computer.

Keywords: ***Raspberry Pi Board (ARM11), Heart beat Sensor, Temperature sensor (LM35), MEMS sensor, IoT Environment, ADC, Raspbian OS(Linux) QT Creator.***

1. INTRODUCTION

Electronic technology is introduced in virtually every aspect of everyday life, and medical field is no exception. The need for well-equipped hospitals and diagnostic centers is increasing day after day, while people are more aware of their health problems. Special units, such as healthcare units or coronary heart disease units are used in the medical field. All of these devices are designed to offer low-cost nurses / patients and equipment and resources collection [1]. To care for the sick or severely injured. Today, the medical world faces two major problems when considering patients: First, the healthcare provider's needs are in the patient's bed, and second, the patient is confined to the bed and connected to the main machine. To receive better quality care for patients, the above issues need to be addressed.

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As technology grows it can create a tracking system that can display, record, and transmit signals from the human body to other locations. Check with your doctor, and also follow the first helpful treatment data on a physician's computer and secondly on mobile Android with a tracker. The system was expected to track critical care patients in an easy and accurate diagnosis, which can be connected to a computer in order to bring it into the system, a network widely to allow the doctor to monitor the patient's status, sitting in his own office without a physical presence at his bedside Section. The system consists of hardware and software components. The physical parameters are processed by the ARM11 process [3], it will be shown to the patient on the monitor and the wrist on the computer by the patient. The same computer data can be examined by two doctors. First on desktop computers that use Remote Desktop Sharing and Android for Mobile Devices with Remote Desktop Sharing.

In today's world-wide medical work today is facing two major issues when it comes to the first patient check, the need for healthcare providers that are located in the patient's bed, and second, the patient is confined to a bed and a large attachment to the host. To receive better quality care for patients, the above issues need to be addressed. As technology grows it can create a tracking system that can display, record, and transmit signals from the human body to other locations. Need more human resources with cost effectiveness. The rest of this paper is organized as follows. The architecture is presented in Section II, and detailed hardware and software implementations are described in Section III. Project Implementation methodology in Section IV. Finally, we conclude our work with results in Section V.

II.SYSTEM ARCHITECTURE

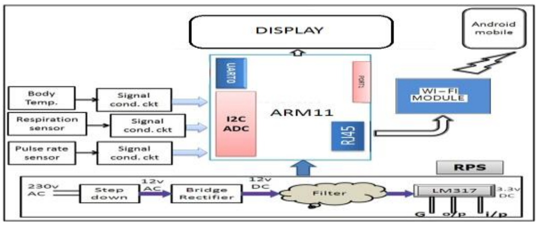

Figure.1 System block diagram

In the request system, the system is expected to track patients in more accurate and convenient care than the diagnostics that can be connected to the computer to bring it into a widespread network for doctors to track the patient's near-patient presence in an IOT environment

III.HARDWARE IMPLEMENTATION

3.1. Raspberry Pi Board

Figure 2: Raspberry Pi3 Board

Raspberry Pi is a credit-card-sized single board computer developed in the UK by Raspberry Pi foundation with the intention of stimulating the teaching of basic computer science in schools. It has two models; Model A has 25 6Mb RAM, one USB port and no network connection. Model B has 5 12Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835 system on a chip which includes an ARMl176JZF -S 700 MHz processor [2], Video Core IV GPU, and an SD card. The GPU is capable of Blu-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied OpenGL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA support. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl, detailed description of Raspberry Pi board has been given in Fig. 2 (Raspberry Pi user guide). Python was chosen as the main programming language, as it is generally accepted to be both easy to learn and a fully fledged , programming language suitable for real world applications. With the addition of NumPy, SciPy, Matplotlib, IPython, and PyLab, Python can be used for computational mathematics as well as for the analysis of experimental data or control systems.

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3.2. ADC PCF8591

PCF8591 is the only low-power, 8-bit CMOS 8-bit CMOS data acquisition tool with four analogs, an analog output and an I2C interface. Three A0, A1 and A2 address needles are used to handle hardware addresses that allow up to 8 devices to be connected to an I2C bus without adding hardware. Addresses, controls and data to and from this device are streamed through the two-way I2C bus [1], [2]. Features of this device include an analog multiplexing chip on the chip and an 8-bit AD converter to digital and an 8-bit digital converter to analog. Maximum conversion rates are determined by the maximum speed of I2C bus.

5 BLOCK DIAGRAM

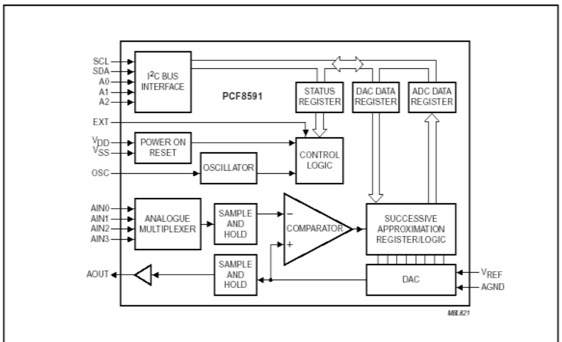

Fig.1 Block diagram.

Fig 3 Block diagram of PCF8591

3.3 IOT Application Gateway

The ARM11 is connected to a router with a wired serial connection. The router runs open source embedded Linux software, providing networking functionality to connect the internet. This essentially provides internet access to the ARM11 board. Router acts as an IoT application gateway and interconnects. A private IPv6 network using a Virtual Private Network (VPN) is used for connecting the IoT application gateway to the server.

The server collects sensor data forwarded by the application gateway and store in a database for further processing and then to be viewed via a website. Data can be viewed in terms of previous day, week, and month time periods graphically. In the present setup, heterogeneous sensing units are designed and developed indigenously for intelligent home monitoring systems to integrate with IoT networks [4].

Figure 4: Internet Router

The Linux-Open WRT software provides the networking architecture to participate in many types of networks. These networks are abstracted into devices, which generalizes management and configuration. This abstraction requires device drivers which operate in the kernel space, making development difficult. A TUN/TAP device driver acts as a virtual network device with its output directed to a user space program instead of a physical device. This simplifies the development of a network device, as a user space program is easier to develop

3.4 HEARTBEAT SENSOR

Heart rate instruments provide simple ways to study the function of the heart. This device monitors the blood flow of the ear. As the heart forces blood to pass through the arteries into the ear rings, the blood count in the ear changes over time. This sensor illumines the light (small light lamps) through the ear and detects the transmitted light. This set can also be used on the fingertips or thumb between fingers and fingers. This symbol is extended, rotated, and filtered in the box. By creating this sign, the heart rate can be determined, and details of the heart pumping activity can be seen on the chart. Personal heart detectors are designed to read the patient rhythm per minute (bpm). Designed devices are small and inexpensive. The technique used to measure heart rate is based on the nearest solar light (NIR). The NIR involves using a 700-900nm wavelength light to measure blood volume. In these wavelengths, most of the tissues do not absorb light - except the hemoglobin (which we take care of).

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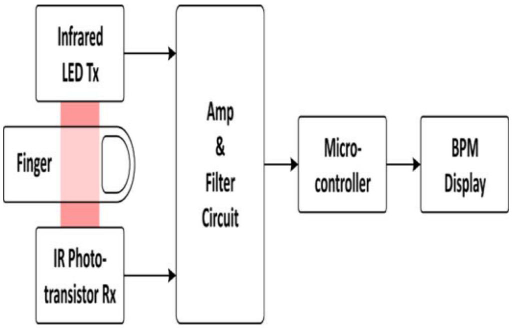

Fig.5 Functional block diagram of the heart rate sensor

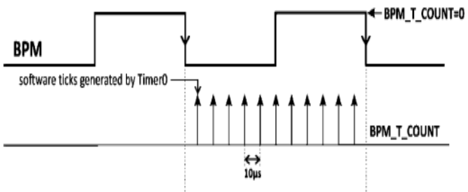

Fig. 6 Heart rate measurement algorithm.

The shape of the frequency is connected to its digital holder microcontroller for further processing. The wave in the phototransistor and endpoint collection (Heart_rate_signal) is shown in Figure 8. The heart rhythm is measured by the hardware separation of the microcontroller. The heart rate as shown in Figure 8 is the square wave with the variable debit rate. Wave steps are measured by the timer 0 and in combination with hardware disruption. Gauge algorithm is explained with reference to the figure. 9. Timer 0 Create a 10 µs pulse. Calculates the total number of checksums per period (BPM_T_COUNT).

Fig 7. Heartbeat Sensor

TEMPERATURE SENSOR (LM35):

The environmental parameters (temperature, humidity and light) are important aspects for deciding whether equipment such as (fans, electric heaters or lamps) should be switched on or off in a wireless monitoring network used for energy management in the home. The following sensors are used in the present setup. The sensor nodes used in the ZigBee WSN have a temperature sensor (TMP 36) operating in the range of -20°C to +125°C. The output voltage out of this sensor varies 1°C for every 10mV with 500mV offset voltage. The light sensor used was LDR [3].

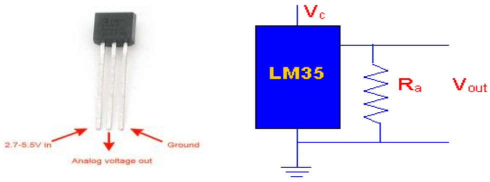

Figure 8: Temperature sensor

MEMS SENSOR:

Micro electro mechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. Their size range from the sub micrometer (or sub micron) level to the millimeter level and there can be any number, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears, diaphragms, and springs to devices.

Examples of MEMS device applications include inkjet-printer cartridges, accelerometers, miniature robots, micro engines, locks, inertial sensors, micro transmissions, micro mirrors, micro actuators, optical scanners, fluid pumps, transducers and chemical, pressure and flow sensors. Many new applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices.

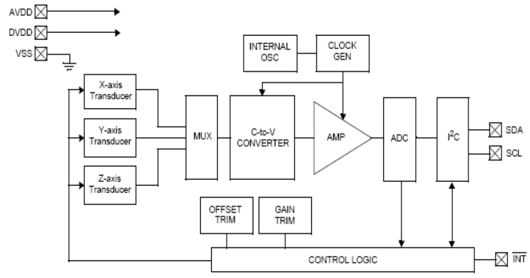

Figure Simplified Accelerometer Functional Block Diagram

Fig 9 Accelerometer block diagram

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IV.EXPERIMENTAL RESULTS

The developed system is tested by installing the Smart sensing units for health monitoring and setting up an IOT based system. Interconnecting IPv6 network is performed by connecting and configuring the modified router (IoT application gateway) as discussed in section III. Integrated system was continuously used and updated real-time sensing information to the server over an IOT environment [2].

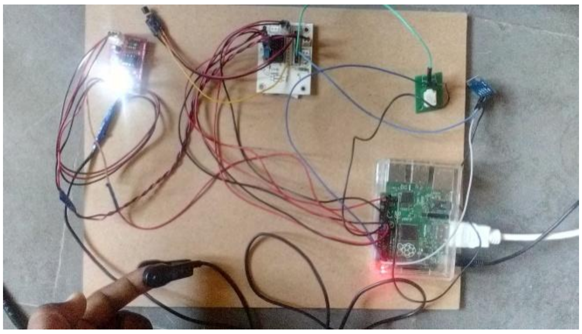

Figure 10: Hardware Prototype

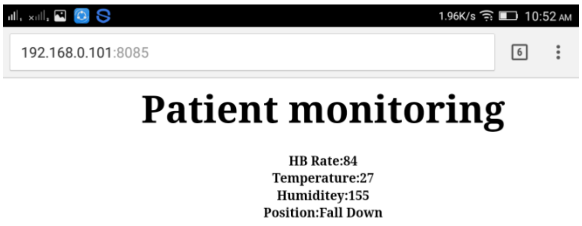

Fig 11: snapshot of when the patient’s temperature increases beyond cutoff value then alerts the nurse and as well as patient position known through MEMS sensor.

V.CONCLUSION

The system reduces costs, allowing patients to monitor patients, eliminate the need for expensive equipment, and reduce the need for patients to go to hospitals and health centers.

This project describes intelligent sensor interaction over IoT using the Raspberry Pi pad for patients. This system can collect data from the sensor. It is designed based on the IEEE1451 protocol integrated with the ARM11 and wireless communication program. It suits the timing and efficiency of high speed data collection systems in the Internet. ARM11 performance is essential in the design of peripheral chains and enabling the whole system to be flexible and expandable. The implementation of IEEE1451 protocol allows the intelligent system to collect data from the device. Various sensor types are available as long as they are connected to the system. The basic method for designing an intelligent sensor interface on IoT devices is described in this project. Finally, while monitoring the Internet's surveillance of the patients, for example, we have confirmed that the system has been successful in practical applications.

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