JOURNAL OF INFORMATION, KNOWLEDGE AND RESEARCH IN ELECTRONICS AND COMMUNICATION ENGINEERING
ISSN: 0975 – 6779| NOV 16 TO OCT 17 | VOLUME – 04, ISSUE – 02

Wireless Medical Surveillance System Using Raspberry Pi and X-Bee

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ABSTRACT :
In these days, wireless communication is more popular and powerful communication technique over the wired communication. In medical science, wireless application rapidly increased with number of advantages over the wired connection such as, its ease to use, its reduced risk of infection, failure and patient discomfort, to enhance mobility. The low cost portable devices like heart rate monitors, SPO2 sensor, temperature monitoring, ECG(Electrocardiogram) and EMG (Electromyography) sensor, are essential instruments in intensive care. It is difficult to monitor the patients continuously, this kind of patients attached with relevant sensors to the body and the patient become sequentially bed bound with sensors. Earlier the patient is monitored from ICU and sends the patient condition to the bed side PC through wired communication.

KEYWORDS:
RASBEERY PI, X-BEE TRANSCEIVER, TRANSFORMER.

I. Introduction

The objective of this project to replace bed-side PC monitoring with wireless PC in ICU (Intensive Care Unit) of hospital. to provide accurate data about patient wellness so that Doctor can make proper treatment to patient. To make hospital surveillance system more flexible with high accuracy. The use of sensor with X-Bee module and GSM will make patients monitoring systems more effective. Here Raspberry Pi is used to continuously update patient's data to the monitoring system. Wireless Sensor Network used to monitor the patient's physiological conditions continuously using X-Bee technology. The X-Bee based sensor network makes the transmission of patient's data to a remote base station (Raspberry pi). The use of X-Bee makes it a low power device. A patient monitoring system during the critical situation plays a vital role in every house. Point-of-care (POC) patient monitoring refers to near patient testing, usually outside the central hospital or primary care facility. The remote monitoring of patients health using Wireless Sensor Networks makes the system more centralized and makes the sensing wireless.

Raspberry Pi makes the system to update the data acquired using wireless sensor network to the server using which a central monitoring of patients is done. In the proposed system, the patient's physiological conditions are acquired by the wireless sensors nodes attached on the patient body, and are then transmitted to the remote base-station. The base station is designed using a Raspberry Pi. These features are explored to communicate with the wireless sensor network designed to acquire data and update the status to monitoring display.

II. Hardware Implementation

The block diagram of the hardware implementation of the entire system is as shown in the Figure.3 Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military applications, etc. The various functionalities of the components are given below:

The various components of Raspberry- Pi are

- Broadcom BCM2835 – single core
- ARM1176
- Lower power consumption- between 0.5 to 1W.
- Video support- HDMI – 1080p
- RCA (analog), without audio
- DSI – for touch screens
- Speed-700MHz
- RAM- 512 MB
- USB 2.0 -4X PORTS
- EXTERNAL STORAGE-SD-card, & support for an external USB2.0 drive
- 40 GPIO pins
- ADC support

1 Temperature sensor

Normal human body temperature, also known as normothermia or euthermia, is a narrow temperature band indicating optimal health and thermoregulation. Individual body temperature depends upon the age, sex, health, and reproductive status of the subject, the place in the body at which the measurement is made, the time of day, the subject's state of consciousness (waking or sleeping), activity level, and emotional state. The measurements taken form body parts such as under the arm or in the ear, produce different typical temperatures. While some people think of these averages as representing normal or ideal measurements, a wide range of temperatures has been found in healthy people. The body temperature of a healthy person varies during the day by about 0.5°C(0.9°F) with lower temperatures in the morning and higher temperatures in the late afternoon and evening, as the body's needs and activities change. Other circumstances also affect the body's temperature.

2 SpO2 sensor

It is a device which measures the percentage of molecules of hemoglobin in the arterial blood saturated with the oxygen. The sensor is put over the thin part of the body. Within the SpO2 sensor, there is a light sensor containing two LEDs as light sources, which emit red and infrared light, on one side and a light sensitive photo-detector on the other one. The lights shine through the body tissues in particular sequences. First the SpO2 activates the red light and it passes through the body tissues and gets to the detector on the other side. Then, the red LED light goes off, whilst lights plus room lights which fall on it. Eventually, when both lights are off, the only light which falls on the detector is room light. At this stage, the amount of the room light is known, thus the sensor can subtract it from LED lights to measure the amount of red and infrared lights seen by the detectors. Oxygenated hemoglobin absorbs more red lights, which have a wavelength of 660nm and deoxygenated hemoglobin absorbs more infrared lights with wavelength of 910nm. By comparing the red and infrared lights, the equipment can calculate the amount of oxygen in the body. Transmission method is used to detect light passing through the finger. In this method, the emitter and photo detector are placed opposite each other with the finger in between such that light can then pass through the finger.

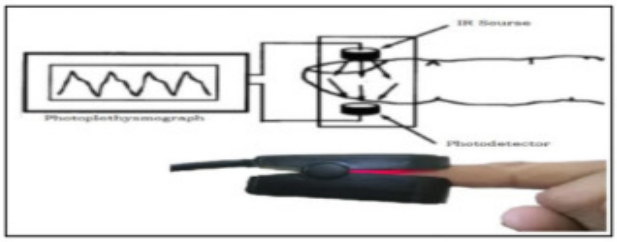

Fig. 1: SpO2 sensor

3 EMG Sensor

"Electromyography (EMG) is an experimental technique concerned with the development, recording and analysis of my electric signals. My electric signals are formed by physiological variations in the state of muscle fiber membranes. " Unlike the classical Neurological EMG, where an artificial muscle response due to external electrical stimulation is analyzed in static conditions, the focus of Kinesiological EMG can be described as the study of the neuromuscular activation of muscles within postural tasks, functional movements, work conditions and treatment/training regimes.

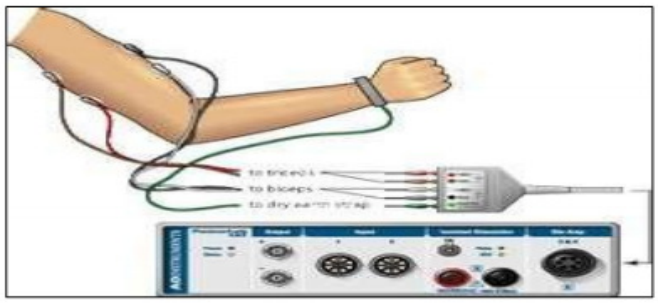

Fig. 2: EMG Sensor

4 ECG Sensor

Electrocardiography is the process of recording the electrical activity of the heart over a period of time using electrodes placed on the skin. These electrodes detect the tiny electrical changes on the skin that arise from the heart muscle's electrophysiological pattern of depolarizing during each heartbeat. It is a very commonly performed cardiology test. In a conventional 12 lead ECG, ten electrodes are placed on the patient's limbs and on the surface of the chest. The overall magnitude of the heart's electrical potential is then measured from twelve different angles ("leads") and is recorded over a period of time (usually 10

seconds).In this way, the overall magnitude and direction of the heart's electrical depolarization is captured at each moment throughout the cardiac cycle. The graph of voltage versus time produced by this noninvasive medical procedure is referred as an electrocardiogram. During each heartbeat, a healthy heart will have an orderly progression of depolarization that starts with pacemaker cells in the senatorial node. This orderly pattern of depolarization gives rise to the characteristic ECG tracing. To the trained clinician, an ECG conveys a large amount of information about the structure of the heart and the function of its electrical conduction system. Among other things, an ECG can be used to measure the rate and rhythm of heartbeats, the size and position of the heart chambers, the presence of any damage to the heart's muscle cells or conduction system, the effects of cardiac drugs, and the function of implanted pacemakers.

5 Heart Rate sensor

The sensor gives the digital output of Heart beat when a finger is placed on it. When the sensor Starts, the led flashes in unison with beat. The output Generated is in beats per minute.

6 X-Bee Transceiver

X-Bee 802.15.4 OEM RF modules are embedded solutions providing wireless end-point connectivity to devices. These modules use the IEEE 802.15.4 networking protocol for fast point-to-multipoint or peer-to-peer networking. X-Bee is an adaptation of the IEEE 80.15 low-data rate WPAN standard. The technology is an alternative to Bluetooth and Wi-Fi networking. Unlike Bluetooth and Wi-Fi, X-Bee requires low data rate (from 250 kbps at 2.4 GHZ to 20 kbps at 868 MHz). X-Bee uses low energy consumption and are low cost devices. X-Bee alliance defined two types of physical devices by in order to lower the costs. Full Function Device (FFD) allows building any topology. It can take a role of a network coordinator and is able to communicate with any other X-Bee device. In a network it master unit in Bluetooth, however the physical design is different to the other type of device (in Bluetooth the devices are in general the same any anyone can take the role of a network coordinator). Reduced function device (RFD) can be used only in a star topology and only as a distant unit. It is controlled be an (FFD) and can communicate only with it after. The implementation of an RFD is strongly simplified comparing to FFD, which significantly lower the cost of the whole system. X-Bee modules are ideal for low-power, low-cost applications. X-Bee-PRO modules are power-amplified versions of X-Bee modules for extended-range applications. Part of the X-Bee family of RF products, these modules are easy-to-use, share a common footprint, and are fully interoperable with other X-Bee products utilizing the same technology. Module users have the ability to substitute one X-Bee module for another with minimal.

III.BLOCK DIAGRAM

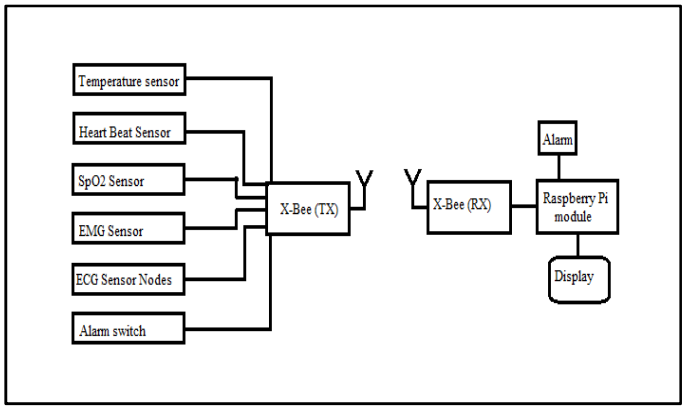

Fig.3 Block diagram of wireless medical surveillance using raspberry pi.

IV.FLOW CHART

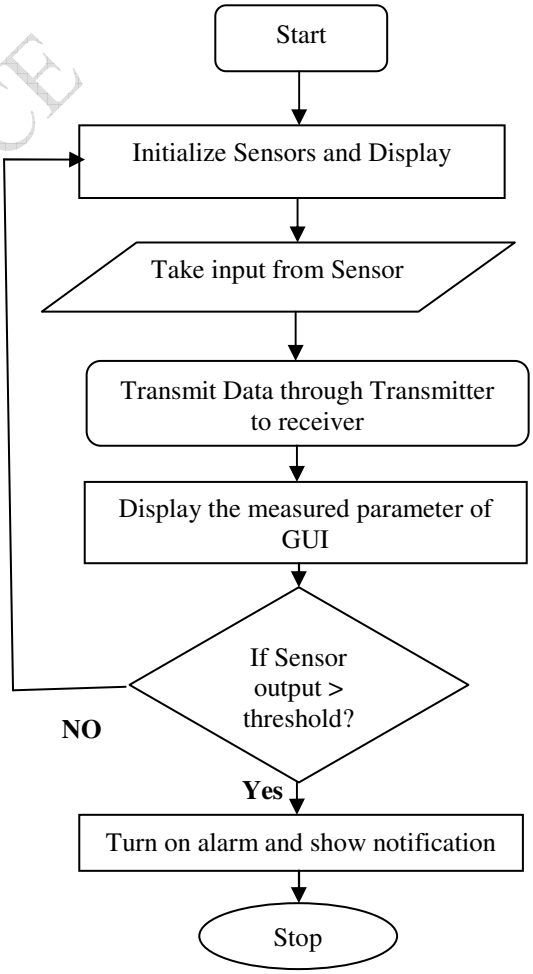

Fig.4 Flowchart of wireless medical surveillance using raspberry pi.

V. APPLICATION

- ICU's (Intensive Care Unit).
- Operation theaters.
- Gives patients freedom of staying at home and living a normal life with their family.
- For personal care unit for Athletes' and Gymanasists

VI. ADVANTAGES

- The main advantage of this system is bridging the gap between doctor and patient.
- Lower power consumption
- Real time response
- Reliable, Low cost , flexibility

VII. FUTURE SCOPE

- The whole health monitoring system, which we have proposed can be integrated into a small compact unit as small as cell phone or wrist watch.
- This will help the patients to easily carry this device with them whenever they go.

VIII.CONCLUSION

According to literature survey there are various health monitoring systems using different microcontrollers, X-bee and other communication channels like Bluetooth etc. but these systems has some disadvantages like some of them are still wired, few number of sensors and in some of them communication range is the main problem.

REFERENCES

1) IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834, p- ISSN: 2278-8735.Volume 9, Issue 1, Ver. I (Jan. 2014), PP 30-32 www.iosrjournals.org 30 | Page Microcontroller Based Heart Beat Monitoring and Alerting System Mayank Kothari Asst. Prof. N MIMS, India.

2) X-Bee Wireless Sensor Networks for Temperature Monitoring Vongsagon Boonsawat, Jurarat Ekchamanonta, Kulwadee Bumrungkhet, and Somsak Kittipiyakul School of Information, Computer, and Communication Technology, Thailand 12000.

3) IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278 1676, p-ISSN: 2320-3331, Volume 9, Issue 3 Ver. VI (May – Jun. 2014), PP 31-38 www.iosrjournals.org 31 Real Time Wireless Health Monitoring System 1Asad Khaliq, 2M. AbdullahAwan , GIK Institute of Engineering Sciences an Technology.

4) Patient Body Monitoring Using Wireless Sensor Network
Rajasekaran.S1, Kumaran.P2, Premnath.G3, Karthik.M4 Computer Science & Engineering.

5) International Journal of Web Technology ISSN: 2278-2389 Integrated Intelligent Research (IIR) 137
Wireless Health Monitoring System Using X-Bee.