Patient monitoring system using wireless transmission

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ABSTRACT

It is very difficult for the medical professionals to keep a constant track of the health status of the patients in the hospitals. A wireless monitoring system design is proposed for remote patient health monitoring. The primary function of this system is to provide real time online information about physiological conditions of a patient. The project is designed to monitor heart rate, temperature and the respiratory rate of a patient and to display the parameters at the doctor's side. In this proposed system, the parameters are sensed by the sensors and values are transmitted by a Wi-Fi module to the doctor's side while simultaneously displaying on the Patient side LCD. This has helped to measure and monitor important physiological data of a patient in order to accurately describe the status of her/his health and fitness.

KEYWORDS*: Wireless transmission, Heart Rate Sensors, Temperature Sensor, Patient Monitoring system*.

1. INTRODUCTION

In recent years the great innovations brings advanced technologies in Medicinal ground. Most of the Health Care Hospitals are trying to make new technologies and uphold the effective enduring treatment with more alert and preventions. Most monitoring systems that are in use in today's world works in offline mode but it are of great need that a system must be designed so that patient can be monitored remotely in real time. The objective of this project is to monitor and improve the quality of care of people in remote location and to provide continuous information about the patient for making better healthcare decisions in critical situation and to reduce the regular check-up of the aged patients. It helps the doctor to monitor their patients at any time apart from their consulting hours. Internet of Things (IoT), gather and share information directly from patients and makes it possible to collect, record and analyse new Data Stream faster and more accurately. This provides data communication capabilities. This connected health care environment promotes the quick flow of information and enables easy access to diseases such as hypertension, cardiac diseases which needs continuous monitoring. The ability of the devices to gather data on their own removes the limitations of human intervention and it reveals the data-automatically and send it to the doctor whenever they needed, thus reduces the risk of error. This type of solution employs sensor comprehensive physiological information and uses gateways and the cloud to analyse and store the information and then send the analysed data wirelessly to caregivers for further analysis and review. It replaces the process of having a health professional come by at regular intervals to check the patient's vital signs, instead providing a continuous automated flow of information. In this way, it simultaneously improves the quality of care through constant attention and lowers the cost of care by eliminating the need for a caregiver to actively enhance in data collection and analysis. Powerful wireless solutions connected through the IoT are now making it possible for monitoring the patients.

2. BLOCK DIAGRAM

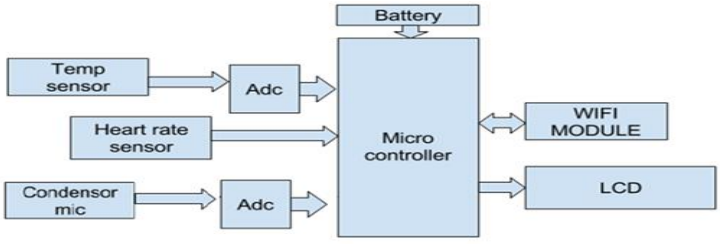

Fig.1 Block Diagram

There are two aspects in our project: Patient side and Doctor Side. The components present on the patient side include: microcontroller, heart rate sensor, condenser Mic, temperature sensor, ADC, LCD and Wi-Fi module.

The doctor's side includes a display device which is connected to the network created by the Wi-Fi module. Heart rate sensor (optical sensor) is connected to the microcontroller which gives a digital value of the number of beats. Temperature sensor (LM35) and respiratory sensor are connected to AT89S52 through ADC. All the sensor signals are displayed on the LCD interfaced with the Microcontroller.The signals from these sensors are given to the microcontroller and this is wirelessly transmitted to the doctor side PC through network created by Wi-Fi module.

3. SENSORS

3.1 Heart rate sensor- The Heart rate sensor is based on the principle of photoplethysmography (PPG) which is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a detector. Since the change in blood volume is synchronous to the heart beat, this technique can be used to calculate the heart rate. Because of the limited penetration depth of the light through organ tissue, the transmittance PPG is applicable to a restricted body part, such as the finger or the ear lobe. The light is emitted into the tissue and the reflected light is measured by the detector. The detected light transmitted through the body part will fluctuate according to the pulsatile blood flow caused by the beating of the heart.

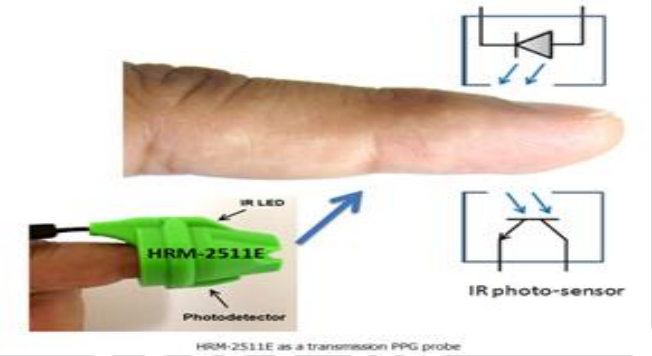

Fig 2- Heart rate sensor

STATUS	RANGE
NORMAL	60 – 100
SLEEPING	40 – 60
TACHYCARDIA	>100

Table 1: Characteristics of a heart rate censor

3.2 Mic condenser- The diaphragm of the microphone forms one of the plates of a capacitor. The other plate is the back plate, which is close to and parallel to the diaphragm. The diaphragm and back plate of the microphone are charged up. This is done through a high-value resistor so the signal is not affected. The capacitance of any capacitor is governed in part by the separation between the plates. The closer the plates, the higher the capacitance. So as the capacitance changes, then the voltage changes inversely in proportion. Since one of the plates of the capacitor in the capacitor microphone is the diaphragm, which moves in response to breathe, then as the separation between the plate's changes in response to that sound, the capacitance changes and so does the voltage across the plates. The AC component of this changing voltage is the signal produced by the microphone in response to sound.

3.3 Temperature sensor - LM35 is a precision IC temperature sensor with its output proportional to the temperature (in$°C$). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 $°C$ temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ $°C$ The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature.

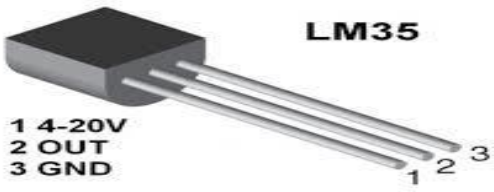

Fig 3- Temperature sensor

4. WI-FI MODULE

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set. It is an extremely cost effective board with a huge, and ever growing, community. The applications of ESP8266 are Smart power plugs, Home automation Wi-Fi location-aware devices, Industrial wireless control, and Security ID tags. The ESP8266 is now one of the leading platforms for Internet of things.

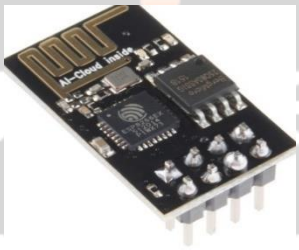

Fig 4- Wi-Fi- Module

5. POWER SUPPLY CIRCUIT

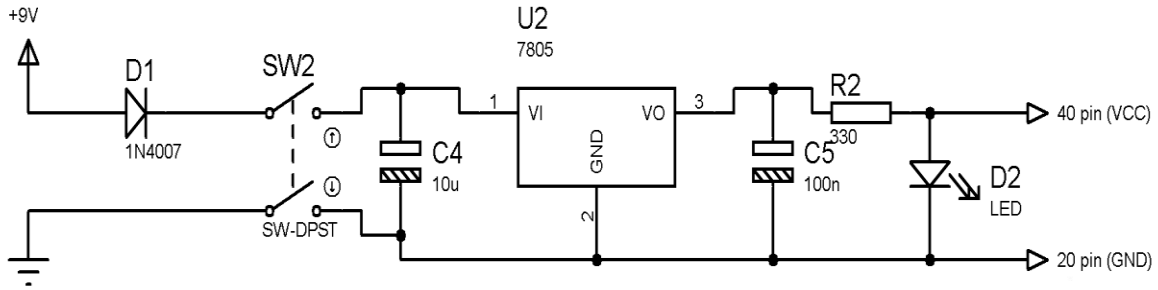

Fig 5- Power supply circuit

A power supply is a device that supplies electric power to an electrical load. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source. The performance of the master box depends on the proper functioning of the power supply unit. The power supply converts not only A.C into D.C, but also provides o/p voltage of 5volts, 1 amp.

Sr no.	Abbreviation	Component	Value
1	BR1	BRIDGE RECTIFIER	W10
2	RT1	REGULATOR	7805
3	C4	CAPACITOR	10uF
4	C5	CAPACITOR	100nF
5	CN1,B1	CONNECTOR,BUG STRIP	-

Table 2: Characteristics of power supply circuit

6. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special characters.

7. SOFTWARE REQUIREMENTS

Keil: Simulation allows software testing without hardware and provides fast edit-compile-test cycles, improves product quality, and enables reproducible regression test results.

Visual basic: The “Visual” part refers to the method used to create the graphical user interface (GUI). Rather than writing numerous lines of code to describe the appearance and location of interface elements, you simply add rebuilt objects into place on screen. Programming in VB is a combination of visually arranging components or controls on a form, specifying attributes and actions of those components, and writing additional lines of code for more functionality. Since default attributes and actions are defined for the components, a simple program can be created without the programmer having to write many lines of code.

8. BENEFITS

- Real time monitoring- The patient monitoring of vital parameters of patient continuously in hospitals and homes when doctors are away.

- Cost efficient - It significantly cuts down the cost of unnecessary visits of the doctor.
- Improved quality of healthcare- There is an improved outcome of treatment since it enables the doctor to access real time information of the patient's disease before they get out of hand.
- More accurate: Chance of human error in checking health parameters are also reduced greatly.
- Reduction in error- Doctors can transfer patient's data for an expert advice or second opinion living in inaccessible or isolated regions via Internet, thus best to be used in rural areas.
- Record Keeping: This system contains GUI which maintains the history of patients.

9. APPLICATION AND FUTURE SCOPE

- Wireless Health monitor tracks the physical status of the patient and in the meanwhile keeps them healthy by real-time monitoring and analyze Wireless Health monitor tracks the physical status of the patient and in the meanwhile keeps them healthy by real-time monitoring and analyzing vital signs to early-detect or predict life-threatening adverse event.
- By using the system, healthcare professionals can monitor, diagnose, and advice their patients all the time from any location with an access to internet.
- Limited hospital resources can be released for people in need of emergency care.
- Enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individual.
- To provide clinical alerts and advisories based on multiple sources of data.
- Checks whether patient is following their prescribed treatment, including taking their prescribed medicine on time.
- In-home health care and services like wireless health monitor can drastically reduce the total expenditure on medical care or treatment and get seamless healthcare in a comfortable home environment.
- The design can include more parameters such as ECG, blood pressure, pulse oximetry apparatus etc.
- The system size can be reduced in order to promote feasibility of easy monitoring.
- The system can be extended by adding more features such as mobile applications like linking ambulance services, leading hospitals for ill home patients.
- These remote health monitoring systems are not only capable of the conventional sensing tasks but can also exchange information with each other ,automatically connect to and exchange information with health institutes through the Internet, significantly simplifying set up and administration tasks.

10. CONCLUSION

In this project, we reviewed the current state and projected future directions for integration of remote health monitoring technologies into the clinical practice of medicine. This paper presents a wireless patient monitoring system using embedded system. Features associated with it are it offers attractive options for enabling observation and recording data in home and work environment, reduced cost due to reduction in hospital visits, need of doctors are less, multipurpose system to measure different health parameters. With its potential use in home and hospital healthcare fields, it has an important role in improving the quality of healthcare.

11. REFERENCES

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