

LIGHT FIDELITY BASED PATIENT MONITORING SYSTEM

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Abstract - This paper illustrates the patient monitoring system using Li-Fi technology. Li-Fi stands for Light Fidelity. Li-Fi technology proposed by the German Physicist Harold Haas. Li-Fi is a bidirectional, high fully networked speed and wireless optical communication and is a form of visible light communication. The proposed model helps in the patient monitoring in the hospitals and can be done by using the concept of Li-fi instead of Wi-Fi technology to avoid the frequency interference with the human body. These sensors collect the data from the human body and convert in to the digital form using the analog to digital converter. The output of these sensors is given to the microcontroller. The microcontroller that is used here is the AVR microcontroller. The output from the microcontroller is fed to the Li-Fi module which transmits the data in the form of light and the receiver end collects this data and this data of the patient is to the mobile.

Key Words: Li-Fi, AVR, VLC, Wi-Fi.

1.INTRODUCTION

In the era of emerging technology, it is necessary to find better solutions for every activity. Nowadays health care expenses are increasing and to reduce this expenses it is required to have a technology based health care systems. Patient monitoring can be done in a very efficient manner using the Li-Fi technology.

Harald Hass in the month of December in year 2013 worked upon the Li-Fi modulation and networked Li-Fi attocell concept, along with Prof.SvilenDimitrov, Prof.ThiloFath, Prof. Irina Stefan and many others contributed to make this technology a big success [3]

Dependency on the wireless internet increases the burden on wireless fidelity (Wi-Fi) technology which, in turn, creates a huge demand for bandwidth and radio spectrum [5]. To reduce the load on Wi-Fi, an alternate mean of wireless internet is Li-Fi finds which find its applications in almost every field, even in vehicle technology [6].

In this prototype I have used mainly four types of sensors which are:

1) Heart rate sensor/pulse rate sensor: this measures the heart rate and also blood oxygen in patients body the heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ it gives us analog output then this output is sent to micro controller

2) Temperate sensor: this sensor helps us to monitor temperature of the patient it uses MAX30205 human body temperature sensor it provides us 16-bit resolution so we can get the accurate reading and then this data is sent to the same microcontroller.

3) ECG sensor (Electrocardiography): I have used ED8232ecg sensor it is used to display the graph and ecg reading in this sensor all the raw data is collected and then sent to microcontroller and then it processed

and send it to our main transmitting microcontroller and then data is converted Into optical signals.

We can also use other sensors such as blood pressure sensor and many other sensors we need to monitor patient.

2. LITERATURE SURVEY

Dr. Harald Hass provided a deep insight in this technology, He introduced an illustration of Li-Fi in the year 2011 at TED Global Conference in Edinburgh, he demonstrated the use of Li-Fi and advantages of Li-Fi over Wi-Fi.

His research led many people to work upon this technology [3]. After that Liang Yin (student member IEEE) together with Prof. Harald Hass made an attempt to show the clear difference between visible light communication (VLC) andlight-fidelity(LiFi),Further they enlightened us how LiFi takes VLC by the use of light emitting diodes [2]. Birgit Wilhelm, SenaitForst ,Matthias M. Weber, MartinLarbig, Andreas Pftzner , Thomas Forst . 2006.

3. WORKING PROCESS



Fig 1. Block Diagram

HEARTBEAT SENSOR

It consists of a bright red LED and a light detector. When the finger is placed close to the sensor a certain amount of light passes through the finger and depending upon the intensity of the light detected in the detector the current is produced accordingly. When no finger is placed brighter light intensity is detected by the detector. So based on the current variations the pulses are recorded and data is obtained.

TEMPERATURE SENSOR

The temperature sensor that is used in the proposed model is LM35. It is a thermistor that is used to measure temperature of patient .The electrical output is proportional to the temperature in Celsius. With the current variations the temperature of the patient is measured.



Fig 2. Working

The working of the Li-Fi module is very simple. It uses the concept of LEDs where logic 1 represents the data transmission and logic 0 represents that there is no transfer of data. The patient monitoring using the Li-Fi is done with the help of sensors.

The sensors that are used in this model are temperature, heart beat and Accelerometer which will perform its necessary function. The sensed data are converted into the digital form using the analog to digital converter which is inbuilt in the microcontroller AVR ATMEGA.

The data is then transmitted in the form of light through the Li-Fi module. The on and the off of the lights indicates the presence and the absence of the information. Rapid pulses are generated by the flickering of these LEDs which produces string of 0s and 1s.The light is detected in the receiver side by the photo detector.

MOTION SENSOR

One of the most common inertial sensors is the motion, a dynamic sensor capable of a vast range of sensing. Motion sensors are available that can measure motion in one, two, or three orthogonal axes. They are typically used in one of three modes:

•As an inertial measurement of velocity and position;

•As a sensor of inclination, tilt, or orientation in 2 or 3 dimensions, as referenced from the acceleration of gravity (1 g = 9.8m/s2);

•As a vibration or impact (shock) sensor.

There are considerable advantages to using an analog accelerometer as opposed to an inclinometer such as a liquid tilt sensor – inclinometers tend to output binary information (indicating a state of on or off), thus it is only possible to detect when the tilt has exceeded some thresholding angle.

MICROCONTROLLER:

Here microcontroller is programmed to convert digital signals received by receiver is now processed and then further displays it to the computer screen we can display received data anywhere as per our requirements. Micro controller used here is ATmega8 that processes signal with very low latency to improve result we can use more.

4. RESULT

The output of the three sensors are displayed in the LCD as shown in the Figure 3.The information regarding the patient is sent to the end user using the mobile application LiFi data monitoring.

5. FUTURE SCOPE

In future we can use image processing for fetching data from the old patient monitoring system so we can use image processing and we can get medical level standards and It will be also more reliable and cost efficient too.

6. CONCLUSION

Patient monitoring can be done efficiently using Li-Fi technology. It reduces the radio interference in human body. It monitors the patient automatically and continuously. It is shown that Li-Fi network is successfully can be used as a high-speed and safe to human body data communication to provide realtime monitoring of heartbeats, temperature, and various other parameters. Li-Fi is emerging as more suitable networks in nextgeneration healthcare services in the hospital. Using this technology in medical field makes diagnosis faster and allows to access the internet along with the radio waves based devices. The proposed system is fully automated.

Patient monitoring can be done efficiently using Li-Fi technology. It reduces the radio interference in human body. It measures the data of the patient automatically and continuously. In the future this system can be used to monitor many patients. Every Bulb in the hospital can be used to monitor the patient.

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