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A Non-Invasive Remote Health Monitoring System Using Visible Light Communication

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ABSTRACT: Diabetes is a metabolic disorder in which blood glucose fluctuates from its normal range. Insulin is a hormone produced in the body to regulate blood glucose level naturally. Regular monitoring of blood glucose is important to avoid complication of diabetes. Commonly used glucose measurement methods are invasive which generally involves finger puncturing. These methods are painful and frequently pricking cause calluses on the skin and have a risk of spreading infectious diseases. Therefore the new method is developed which monitoring the measure of blood glucose continuously without much problem. This is possible with Sensor patch using LED and a photo. It observes diffused deflection spectra of blood from the human forearm. The main advantage of this system is monitoring the patient's glucose level continuously by using Visible Light Communication. Li-Fi technology is a fast communication method compared to Wi-Fi and also have no effect on the human body.

KEYWORDS: Blood glucose level, arduino, Li-Fi, diabetes, non-invasive, heart beat sensor, glucose sensor.

I. INTRODUCTION

The main objective of evolving patient monitoring system is to reduce the costs involved in health care by reducing emergency room, Clinical visits, hospitalizations and diagnostic testing process. New wireless transmission protocols and expertise is adapted to develop modern applications.Patient monitoring can be done in a very efficient manner using the Li-Fi technology. Patient monitoring refers to "repeated or continuous observations or measurements of the patient, his/her physiological

function, and the function of life support equipment, for the purpose of guiding management decisions, including when to make therapeutics interventions, and assessment of thoseintervention"

Patient monitoring done by the Wi-Fi is slower when compared to the Li-Fi and it also has less bandwidth. Reliability is better in Li-Fi than Wi-Fi. Since transmission of data by Wi-Fi is through RF waves, there is a high possibility that these waves might affect the human body. The designation of these signals may be carcinogenic and this has been given by the World Health Organization. To solve this problem, Li-Fi (light fidelity) technology is used for healthy environment. Light fidelity is transmission of information through optical wireless medium. Sensors such as heart beat, temperature, and motion sensor are used transmitted through the LiFi module. Rapid pulses are generated in the form of 0s and 1s. Photo diode is used at the receiver end. Flickering of light takes place at the rate of hundreds of megabits per seconds. By using Bluetooth, the receiver is connected to mobile. The information received in the mobile can be displayed in the mobile through an application. The range of the Li-Fi technology is 10m and secured communication is possible. The transmission of information by light through wireless is termed as Visible Light Communication (VLC).

II. EXISTING SYSTEM

In the existing system, Diabetic patients need to monitor their blood glucose two to three times a day. Most commercially available glucose measurement devices are invasive. The patients must to check of its glucose level in the clinic. The invasive methods are painful, have high recurringcost and danger of spreading infectious diseases and

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the following report is not accurate. This system fully based on human response which in turn sometimes human error will occur.

DISADVANTAGES OF EXISTING SYSTEM

- Danger of spreading infectious diseases.
- Painful method
- Very complexity

III. PROPOSED SYSTEM

In the proposed system, the new non invasive method is presented. Here sensor is to monitor the blood glucose level of the patient. The main advantage of this system is measuring the blood glucose level in non-invasive method. The result can be viewed in the smart phone. High rise of glucose level may lead to heart attack or any difficulty situations. Non-invasive glucose monitoring could make millions of people more relaxed and comfortable about blood glucose testing. LED non-invasive blood glucose sensor is used to detect the blood glucose content, if any abnormality occurs the intimation is sent to mobile. High Level Glucose Insulin Injector Will be Injected From Servo Motor Side if high glucose detected. This information are updating continuously in mobile via Li-Fi technology.

ADVANTAGES OF PROPOSED SYSTEM

- Highly efficient method
- Easily identify method
- Easy way to monitor the blood glucose without taking blood.

BLOCK DIAGRAM

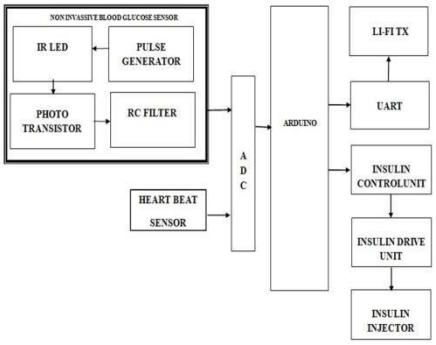

Fig1 block diagram of prototype of proposed system

IV.HARDWARWE COMPONENTS

A.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.

B.Glucose sensor

It is an amperometric electrochemical biosensor generating a current from the electrochemical reaction between glucose and a glucose oxidase layer on working electrode (WE). The use of iridium-oxide nanoparticles helps for the transfer of the electrons from the glucose oxidase to WE. Glucose sensors are used to measure the blood glucose concentration of a patient and are an important part of managing diabetes mellitus.

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C.Arduino

It is an open-sourcemicrocontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analoginput/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

V.RESULT

1.LCD output

The output of the sensors are displayed in the LCD as shown in the Figure 2.The information regarding the patient is sent to the end user using the mobile

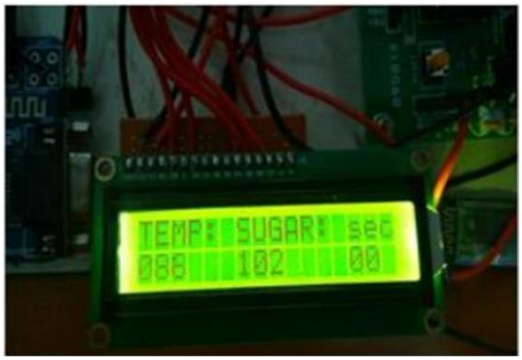

Fig.2 indication of the sensors

2. SOFTWARE OUTPUT

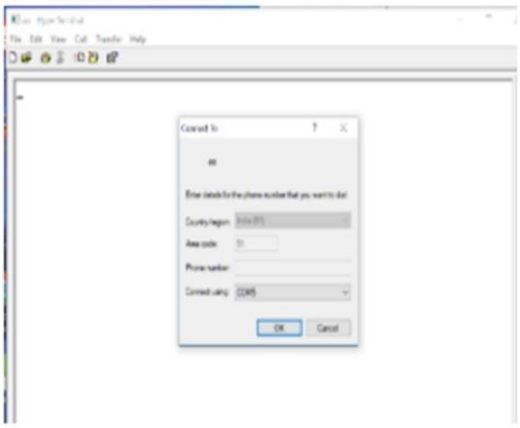

Fig 3. Connect using com5

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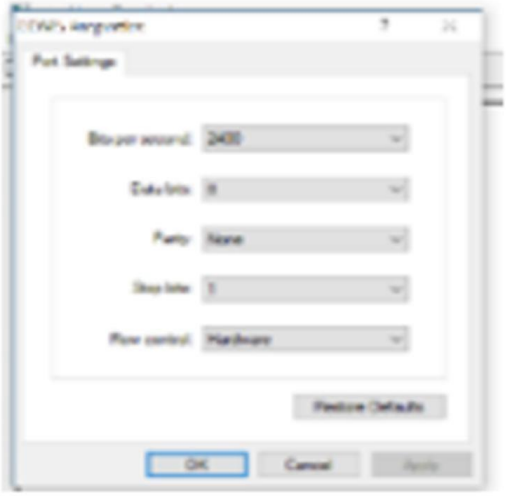

Fig.4 description of com5 properties

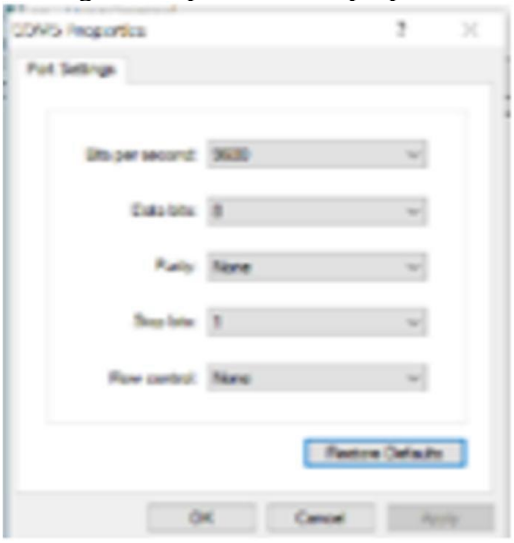

Fig.5 reset the properties to default values

VI. 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 real time monitoring of heartbeats and various other parameters. Li-Fi is emerging as more suitable networks in next generation 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.

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