Non Invasive Blood Glucose Monitoring For Diabetes Patient Using NIR Sensor And Raspberry Pi

[1] Jamunalaksmi K.P,[2] Gunasundari.D,[3] Kanagadhara.A,[4] Nivas.R
[1]Asst. Professor,[2,3,4]UG students ,Electronics and Communication Engineering

Abstract: This paper describes the method of measurement of glucose concentration in the human blood non- invasively using the near infrared optical technique.Inrecent medical practice, the concentration of glucose in blood is measured using an invasive techniques which generally involves puncturing finger. In generic few ml of blood whereas in recent practice less than a drop of blood is taken out and passed through the standard chemicaltests to measure glucose concentration. These methods are expensive as well as painful. The frequent finger puncturing causes calluses on the skin and also increases the risk of spreading infectious diseases. So, the development of a non-invasive blood glucose measurement system will be boon to the diabetic patients. This paper describes the method of blood sugar measurement in the human blood non-invasively using the painless near infrared based optical technique. The designed system consists of LED emitting signals of 940 nm wavelength. These optical signals are sent through the fingertip and reflected signals are detected by phototransistor placed beside the LED. The glucose concentration in the blood is determined by analyzing the variation in the intensity of received signal obtained after reflection. The results obtained from the designed system shows the feasibility of using NIR based non-invasive method for the measurement of blood glucose. The described system is majorly useful for diabetic patients. The measurement accuracy of the proposed system can be improved by incorporating it with noise filtering techniques.

I. INTRODUCTION

The number of diabetes patients are increasing day by day Diabetes is a disease due to Insulin (less production or not efficiently used).Insulin is a hormone that regulates blood sugar.
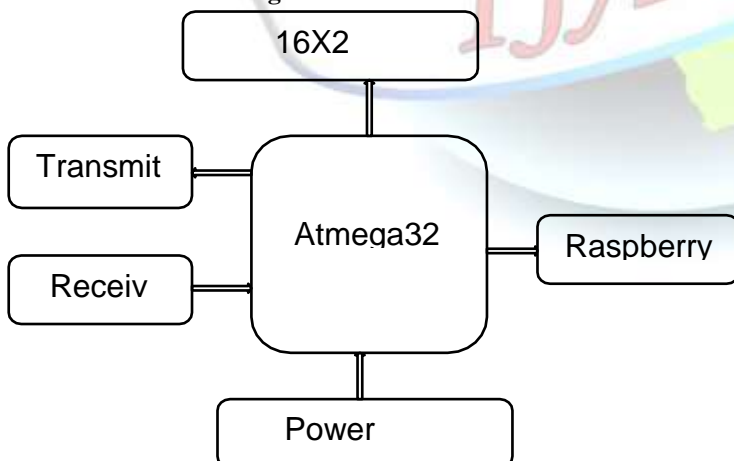
I. Block Diagram

Fig.1 BLOCK DIAGRAM

A.BLOCK DIAGRAM DESCRIPTION

Raspberry pi are connected with atmega328p. The various inputs are given by the program. The output will get the through raspberry pi. The transmitter and receiver connected with atmega328p and 16X2 LCD connected with atmega328p.The power supply given to the atmega328p.

II. COMPONENT USED

A.RASPBERRYPI

The Raspberry Pi 3 Model B is an upgraded ARMv7 multi core processor and Gigabytes of RAM, this seems to be a pocket computer and able to move from being a 'toy computer' to a real desktop PC requirement. The big upgrade is a move from the BCM2836 (single core ARMv6) to BCM2837 (quad core ARMv7). The Processor speed increases 2 times that is equal to multi core processors. By efficiently using architecture the speed may increases from 4 to 7.5 times. This processor improves the quantity performance web browsing and game playing. The Pi 3 will run the all other daughter boards at 99 % efficiency.

Fig.2 RASPBERRYPI B.ATMEGA328p

The high-performance Microchip pico Power 8- bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2- wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.
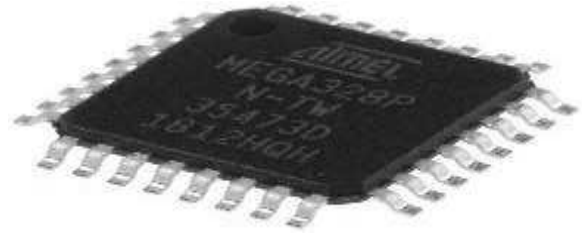

Fig.3   ATMEGA328p

C.TRANSMITTER

Transmitters are necessary component parts of all electronic devices that communicate by radio, such as radio and television broadcasting stations, cell phones, walkie-talkies, wireless computer networks, Bluetooth enabled devices, garage door openers, two-way radios in aircraft, ships, spacecraft, radar sets and navigational beacons. The term transmitter is usually limited to equipment that generates radio waves for communication purposes; or radiolocation, such as radar and navigational transmitters. Generators of radio waves for heating or industrial purposes, such as microwave ovens or diathermy equipment, are not usually called transmitters, even though they often have similar circuits.

D.RECEIVER

An audio/video receiver (AVR) is consumer electronics component used in a home theater. Its purpose is to receive audio and video signals from a number of sources, and to process them and provide power amplifiers to drive loudspeakers and route the video to displays such as a television, monitor or video projector. Inputs may come from a satellite receiver, radio, DVD players, Blu-ray Disc players, VCRs or video game

consoles, among others. The AVR source selection and settings such as volume, are typically set by a remote controller.

E.16*2 LCD DISPLAY

An **LCD** is an electronic **display** module which uses **liquid crystal** to produce a visible image. The **16×2 LCD display** is a very basic module commonly used in DIYs and circuits. The **16×2** translates o a **display 16** characters per line in **2** such lines. In this **LCD** each character is **displayed** in a 5×7 pixel matrix
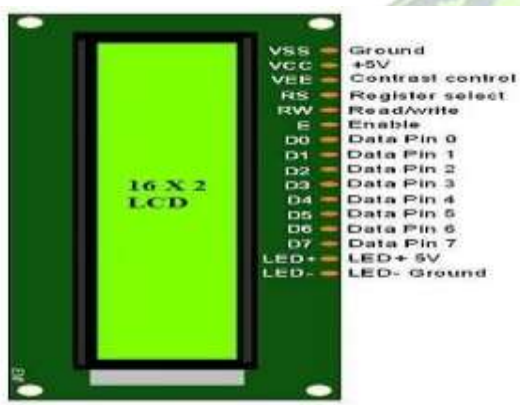

Fig.4 16*2 LCD DISPLAY

III. SOFTWARE

A.Python

Python is a high-level language. This means that Python code is written in largely recognizable English, providing the Pi with commands in a manner that is quick to learn and easy to follow. This is in marked contrast to low-level languages, like assembler, which are closer to how the computer "thinks" but almost impossible for a human to follow without experience. The high-level nature and clear syntax of Python make it a valuable tool for anyone who wants to learn to program. It is also the language that is recommended by the Raspberry Pi Foundation for those looking to progress from the simple Scratch. A value is one of the basic things a program works with, like a letter or a number. The values we have seen so far are 1, 2, and 'Hello, World!' These values belong to different types: 2 is an integer, and 'Hello, World!' is a string, so called because it contains a "string" of letters. You (and the interpreter) can identify strings because they are enclosed in quotation marks. The print statement also works for integers. We use the python command to start the interpreter.

IV. CONCLUSION

Non- invasive glucose monitoring device have many advantages for diabetic patient. In general all non invasive optical glucose sensor technology suffers from human environmental factors such as body temperature ,skin moisture, skin thickness and motion which makes it difficult to be used due to the optical path of the excitation light. The most common technology that has been widely studied is the NIR spectroscopy. In this optical we have presented a noninvasive blood glucose meter that can provide glucose measurement painlessly without a blood sample finger pricks within a few seconds.

REFERENCE

[1]. MeghaS.Asekar,"Development of Portable Non-invasive Blood Glucose Measuring Device Using NIR Spectroscopy". Proceedings of the Second International Conference on Intelligent Computing and Control Systems (ICICCS 2014).

[2]. S.Jeyapriya, R.Ramalakshmi."Glucose Monitoring and Control in Diabetes Using GSM and Automatic Insulin Injector System for Human Bodies".2017 IEEE international conference on intelligent techniques in control, optimization and signal processing.

[3]. PrafulP. Pai, Pradyut K.Sanki, Sudeep K. Sahoo, Arijit De, Sourangshu Bhattacharya, and Swapna Banerjee. "Cloud Computing-Based Non-Invasive Glucose Monitoring for Diabetic Care". IEEE transactions on circuits and systems– I.

[4]. Khalil OS. Non-invasive glucose measurement technologies: an update from 1999 to the dawn of the new millennium. Diabetes Tech no 1 Ther. 2004;6 (5):660–697.

[5]. Dhanapal, R., & Visalakshi, P. (2015). Efficient Clustering protocol based on Ant-Bee agent for Large Scale MANET. International Journal of Applied Engineering Research, 10(52), 2015.

[6]. Mathew, O. Cyril, R. Dhanapal, P. Visalakshi, K. G. Parthiban, and S. Karthik. "Distributed Security Model for Remote Healthcare (DSM-RH) Services in Internet of Things Environment." Journal of Medical Imaging and Health Informatics 10, no. 1 (2020): 185-193.

[7]. Dhanapal, R., & Visalakshi, P. (2016). Real time health care monitoring system for driver community using ADHOC sensor network. Journal of Medical Imaging and Health Informatics, 6(3), 811-815.

[8]. Yuvaraj, N., G. Saravanan, R. Dhanapal, and M. Premkumar. "Towards Efficient Data Transmission using Energy-based Clustering Model (ECM-EDT) in Heterogeneous VANET." (2020).

[9]. Dhanapal, R., T. Akila, Syed Shuja Hussain, and Dinesh Mavaluru. "A Cost-Aware Method for Tasks Allocation on the Internet of Things by Grouping the Submitted Tasks." Journal of Internet Technology 20, no. 7 (2019): 2055-2062.

[10]. Parthiban, K. G., S. Vijayachitra, and R. Dhanapal. "Hybrid Dragonfly Optimization-Based Artificial Neural Network for the Recognition of Epilepsy." International Journal of Computational Intelligence Systems 12, no. 2 (2019): 1261-1269.

[11]. Dhanapal, R., and P. Visalakshi. "A Sector Based Energy Efficient Adaptive Routing Protocol for Large Scale MANET." Research Journal of Applied Sciences, Engineering and Technology 9, no. 7 (2015): 478-484.