Design of Automatic Insulin Dosage Indicator For Diabetic Patients Using BMI

Niranjan.J[1], Kavidharshini.K[2], Oviya.T[3], Deepa.K[4], G. Jayanthi[5]
[1, 2, 3, 4] Dept of Electronics and Communication Engineering
[5]Assi. Proff., Dept of Electronics and Communication Engineering
[1, 2 , 3, 4, 5]Parisutham institute of technology and science, Thanjavur ,Tamilnadu

Abstract- *The main theme of this project is to indicate the insulin dosage for diabetic patient using BMI by automatic . The pattern of glucose changes ,concentration of glucose in blood needs to be monitored ,After monitoring the blood glucose , patients should take proper doses of insulin regularly.Blood glucose concentration is currently measured using three broad categories of BGM techniques . For this ,it requires a blood sample which is extracted from the human body by puncturing the skin.The latest advances introduced to the field of BGM are non-invasive techniques to detect blood glucose concentration. The insulin dosage based on the blood glucose concentration , BMI and blood density of the patients by using non-invasive technique.*

Keywords-invasive technique, Infrared sensor, Insulin, Injection, blood glucose.

I. INTRODUCTION

The Automation in medical technologies have been developed around since decades and are in the continuous process of development, some latest technologies are changing the way medicine would be practiced in the future. These technologies would allow medical practice from anywhere, anytime and from any device.Medical device reminds a patient of taking a medication dose, checking blood pressure at a scheduled time. A single wearable medical device can be used to measure and check various parameters related to a disorder. The automation in medical device and its usage in day to day life is very helpful and needful for the chronic illness.

Among various chronic disorders, Diabetes is one of the major disorder that governs the world since decades. More than 1 in every 10 adults have been affected by diabetes. Diabetes Mellitus is a metabolic disease that occurs when a person has uncontrollable blood glucose levels over a long period. It can further lead to other problems such as kidney failure, heart disease, blindness, stroke and neuropathy.

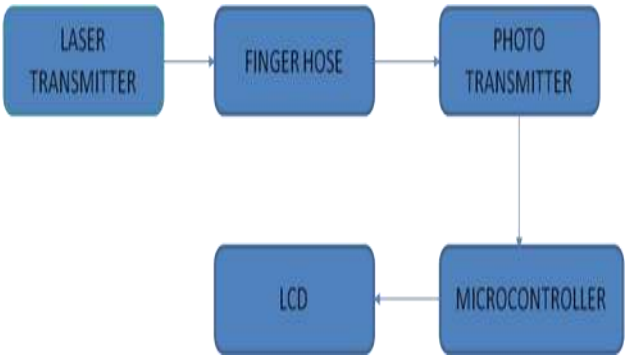
To know the pattern of glucose changes, concentration of glucose in blood needs to be monitored. After measuring the blood glucose, patients should take proper doses of insulin regularly. Blood glucose concentration is currently measured using three broad categories of Blood Glucose Monitoring (BGM) techniques.Invasive techniques require a blood sample which is extracted from the human body by puncturing the skin.Minimally invasive techniques involve attaching electrodes to the skin tissue.The latest advances introduced to the field of BGM are non-invasive techniques to detect blood glucose concentration by employing optical techniques.

II. PROBLEM IDENTIFICATION

Nowadays, most of the people (children,adults and aged persons) are affected by diabetes and they are supposed to take insulin continuously. The current BGM technique is a repetitively painful process as it is done by puncturing the skin and thus it creates the risk of infection. Especially the aged persons and children should have a sudden rise or fall in their blood glucose level (hyperglycemia and hypoglycemia) due to their food habits.There is no method available for frequent checking of blood sugar level and comparing it with various body parameters to prescribe insulin dosage

III. EXISTING SYSTEM

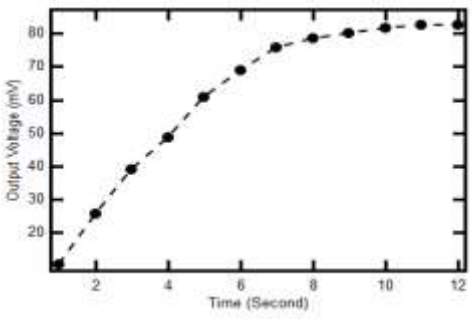
The human finger is inserted into the finger hose of the RL-BGM and laser light is passed through it. The variation in blood glucose level is observed in terms of the changes in the output voltage.The variations in blood glucose levels are observed on the voltmeter and the results are also displayed on LCD using the microcontroller.The main purpose of measuring the output voltage through voltmeter and LCD is to make sure that there is no difference between the two voltages as an error in the output voltage can affect the actual reading of the glucose level.

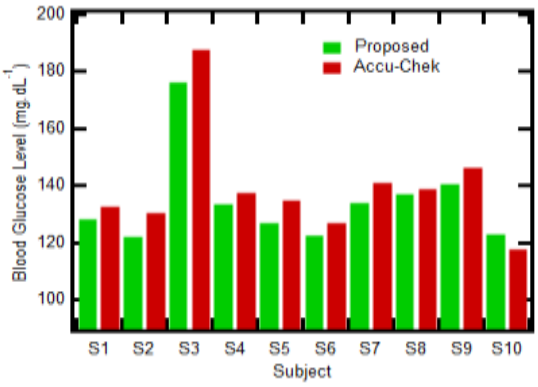


IV. EXISTING SYSTEM –DRAWBACKS

The current insulin injection system is provided to take the amount of insulin prescribed by the physician after monitoring the blood glucose level once for a certain period of time.Blood Glucose Monitoring (BGM) techniques are invasive as they require a finger prick blood sample.In non-invasive techniques there is no determination of insulin dosage.The amount of insulin prescription is only based on the blood glucose level of the patient.

V. EXISTING SYSTEM RESULT





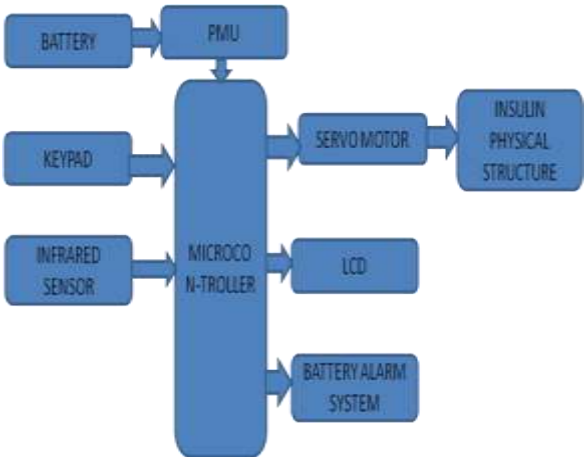
VI. PROPOSED SYSTEM

The proposed system is to provide an automatic insulin dosage indicator system by monitoring the blood glucose level using the optical technique.The amount of insulin is estimated by calculating body mass index of the patient and comparing it with the blood glucose and blood density of the patient.The insulin dosage is varies with the different patients having same glucose level but different BMI.It also measure blood density in terms of heart beat count to prescribe the insulin dosage.

The proposed design includes the IR LED, PIC microcontroller and other such units that are used to indicate the insulin dosage automatically to the patients.The IR LED is used to sense the human finger and it calculates the blood glucose concentration of the patient in the form of blood density by sending the sensed output to the PIC microcontroller.The PIC is referred to as Peripheral Interface Controller. As the name indicates, PIC is used as a control over the design. The micro controller will be programmed in assembly using microchip MP-LAB IDE. PIC is used for serial communication with device software.

The determined blood glucose density and the BMI of the person is given to the PIC controller. The micro controller is then interfaced with the terminal software for indicating the insulin dosage by comparing the glucose concentration, blood density and BMI of the patient.The BMI is varying with each and every human. So the BMI is categorized as three proportions for the effective comparison with blood glucose concentration.The blood density is determined by heart beat count for 30 seconds for proper prescription of dosage of insulin.

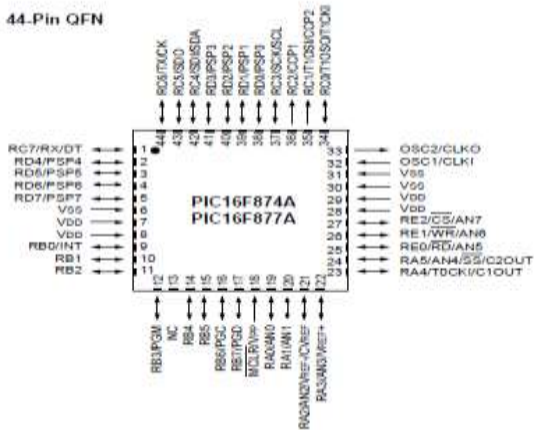
VII. BLOCK DIAGRAM



VIII. DESCRIPTION

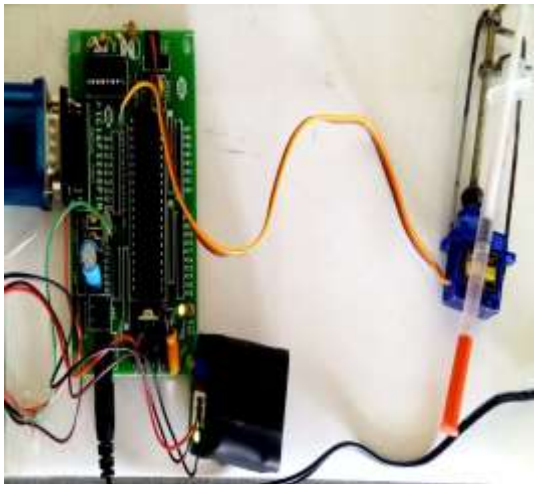
The entire proposed design is provided with a supply voltage of 5v DC. The regulated power supply accepts unregulated inputs from 9V to 15V AC or DC and gives regulated output of 5V and 3.3V suitable for microcontroller which needs precise voltage to work.Infrared (IR) light is electromagnetic radiation with a wavelength longer than that of visible light, measured from the nominal edge of visible red light at 0.74 micrometers (µm), and extending conventionally to 300 µm. Infrared sensors can measure the heat of an object.In this work the IR LED is used to sense the human finger and it calculates the blood glucose concentration of the patient in the form of refractive index of the light beam by sending the sensed output to the PIC microcontroller.

The PIC16F874A devices have 44-pin packages. It has 5 I/O ports and it is also provided with 15 interrupts.The PIC controller provides 8 analog to digital converter.The microcontroller incorporates all of the functions necessary to meet the specifications of the work. The PIC is used to control the glucose test circuit, analyze measurements, handle user input.It is given with the input as output voltage from the IR LED.The microcontroller indicates the dosage of insulin by integrating it with the software dataof given BMI and blood density of the patient .

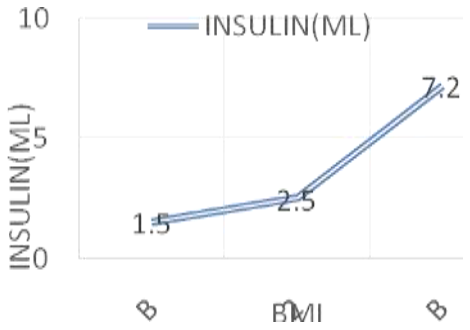


IX. RESULT AND DISCUSSION

A hardware prototype that is to indicate the details about the amount of insulin to be injected to the patients according to their blood glucose level, blood density and their BMI is implemented.



INSULIN(ml)Vs BMI



RECOMMENDED INSULIN DOSAGE

BMI<25	70-150 150-250 >250	No Insulin 1.5 5.5
25<BMI<30	70-150 150-250 >250	No Insulin 2.5 6.5
BMI>30	70-150 150-250 >250	No Insulin 7.2 8.5

X. SIGNIFICANC

The automatic insulin dosage prediction evolves as an easy way to control the sugar level of the diabetic patients.Especially aged persons and children have an effective result by this system.The sudden rise and fall in blood sugar level can be easily handled.

XI. CONCLUSION

The results show that the proposed design is given the appropriate blood density of the blood and proper insulin is prescribed. The proposed design is helpful for all diabetic patients especially, for children and aged persons. The proposed work is very essential to a diabetic patient for daily life for determining the condition of hyperglycemia and hypoglycemia and providing appropriate insulin to the blood glucose concentration.

XII. FUTURE WORK

In future, the proper insulin dosage is prescribed by combining both the BMI and blood glucose concentration with some linearization techniques. The proposed design is developed into a wearable prototype. Various non-invasive techniques will be developed further with the following requirements:

1. To reduce the risk of infection.
2. To increase the automation in medical applications.

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