PERSONAL HEALTH CARE MONITORING DEVICE FOR DIABETIC PATIENTS

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ABSTRACT

In this project presenting a breath test to monitor the condition of diabetic patients. It is identified by detecting the diabetic of type 1 diabetes mellitus. Common diabetic test on patients are done on urinary test and blood ketone test to monitor for diabetes condition. Those methods are invasive, inconvenient and expensive. Recently, breath acetone has been considered as a new ketone biomarker because it is non-invasive, convenient, and accurate reflection of the body's ketone level. This research presents a method of monitoring ketone level by using breath Measurement. Main objective of this research is to present an easy handheld health care on monitoring diabetic level with breath. Method consists of development of hardware connection with Internet of Things (IoT) system to facilitate the process of patients' diagnosis and personal monitoring. In this system,

Arduino board is used to read the sensor with sense breath. Breath value level is long to system using wireless communication. Data collection is interfaced to web page through node mcu. Ketone level is measured as the amount of breath acetone is collected when patients exhale into a mouth piece that consists of gas sensor. The reading from Arduino is shared to the data base.

ESP8266 Wi-Fi module and can be accessed by the patients or registered doctors. This research is significant where patients can independently monitor there diabetic health and the IoT system can be alerted directly to medical officers in the hospitals.

Keywords: ketone, personal monitoring system, acetone, exhaled breath, Internet of Things, sensor.

INTRODUCTION

Today's medical records present that type1 diabetes mellitus is a major health problem worldwide. There were about 2.6 million adults age 18 years and above living with diabetes and the burden of diabetes is said to be continuously increase in Malaysia. Ketones are chemicals are in the body, when the body fat is used for energy instead of glucose. Ketone bodies increase the intracellular glucose concentration by providing an alternative metabolic substrate. Ketone testing is a key part of type1 diabetes management. Ketone builds up when there is a insufficient insulin to help to energize the body's cells. When the body as too little insulin, it means that the cells of the body cannot take sufficient sugar (glucose) from the blood. To compensate this, the body will start to burns the fat to provide ketones. Insulin is needed to help bodies to use glucose for energy. Therefore, measure the ketone level can help to control and monitor the condition of the diabetic patients as the large nu mber of ketones means diabetes is out of control. Generally, blood and urinary ketone detections have been widely used for diagnosis of diabetic ketoacidosis (DKA).However both methods have been considered invasive, painful and inconvenient. Acetone is qualitatively known as biomarker of diabetes. Acetone is a normal breathe constituent and is responsible for the sweet odor of the breathe of ketobetix and diabetic individuals. It is produced mainly from the spontaneous decarboxylation of acetoacetate and, to a lesser degree, by the enzymatic conversion of acetoacetate to acetone via the enzyme acetoacetate decarboxylise. The concentration of breathe acetone is associated with glucose metabolism and lipolysis. Therefore, breathe acetone concentration is reported to the elevated in type-1 diabetes mellitus, and it can be used to diagnose the onset of diabetes. This research presents a non-invasion breathe test to monitor the condition of diabetic patients where it is identified as an easier technique and quick diagnoses of diabetic ketoacidosis that prevent accurate complication of type-1 diabetes mellitus.

A method of monitoring ketone level by using breathe measurement is done. An easy handheld health care on monitoring diabetic level with breathe is presented. Method presented a development of hardware connection with Internet of Things (IoT) system to facilitate the process of patients' diagnosis and personal monitoring. An Arduino board is used to read the sensor with sense the breath. Breath value level is log to system using wireless communication. Data collection is interfaced to web page. Ketone level is measured as the amount of breath acetone is collected when patients exhale into a mouthpiece that consists of gas sensor. This research is identified as a sufficient research where patients can independently monitor their diabetic health and the IoT system can be alerted directly to medical officers in the hospitals.

LITERATURE SURVEY

Technology enhanced has enabled most system to be presented in web based or online system. Today, the IoT has changed our lives by offering greater promise where its principles are already being applied to improve access to care, increase the quality of care and reduce the cost of care. The use of Internet for various health care related reasons from the perspective of end-users, especially patients. In the field of health care, collecting real time data is vital. Thus the method of non-invasive and IoT driven diabetes monitoring system is introduced in this paper. The amount of breath acetone is measure by using gas sensor. The data from the sensor is sent to Arduino Uno. For the real data collection and storage, the reading from Arduino is sent to local data base and the patient is able to view the data via web page.

- In 1962, Clark and Annlyons from the Cincinnati children's hospital developed by 1st glucose enzyme electrode.
- In 1970s Anton H.clemens developed Ames Reflectance Meter.
- In 1990s Glucose developed by bayer.
- A1C test method id developed by Anthony cerami at the Rockefeller hospital in 1996.

BLOCK DIAGRAM

The block diagram of the system. Two types of sensors are used as the inputs in this system microcontroller collected the data from both the sensors. The data is processed and analyzed while the microcontroller printed the values from data on the LCD. The output is then shared into the web data base via Wi-Fi module

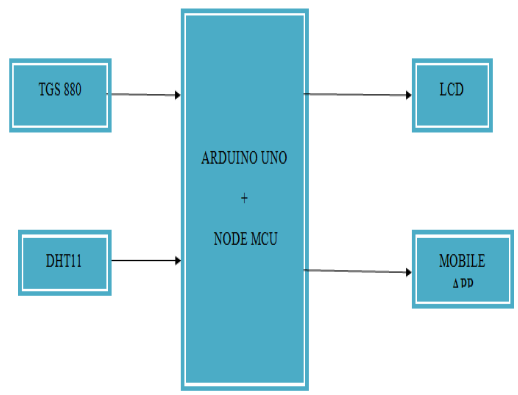
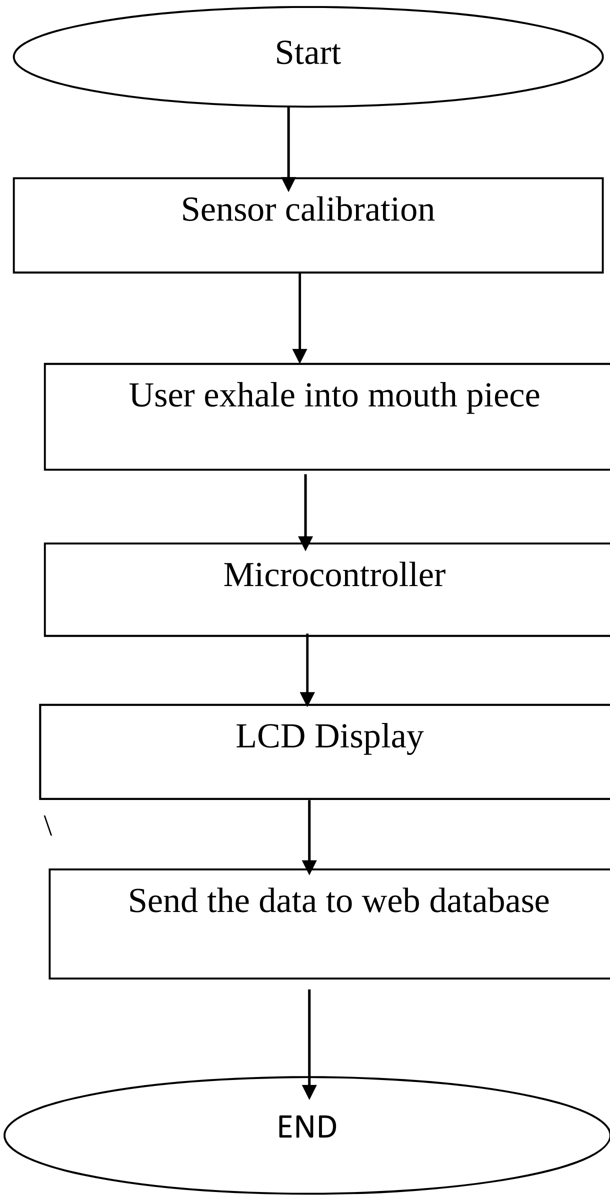


Fig 1. Block diagram of monitoring device

. This development consists of two types of Arduino which are Uno and node mcu. Arduino Uno is used as the main board to read sensor values FIGARO TGS880 sensor is connected to analog pin zero with a 10k resister to create a voltage divider circuit DHT11 sensor connected digital input pin10.node mcu is used has a Wi-Fi module which as an inbuilt Wi-Fi module ESP8266. Two different Arduino is used to communicate through the board because the gas sensor consumes quite a lot of power supply. If Arduino Uno alone is used to connect between the sensors and Wi-Fi modules, the device might become unstable. Therefore, another node mcu is used which as the inbuilt Wi-Fi module that is ESP8266.

FLOW CHART



The above flow chart explains the overall of system development until data collections and presentations on the web. Sensor calibration is proposed where user gives the breathe into the mouthpiece of the monitoring device. Later, the values will be recorded to the micro controller. LCD will display the ketone level per unit. Finally the data collections from the sensors on user will be kept in a database.

COMPONENTS

The data is processed and analyzed while the microcontroller printed the values from the data on the LCD. The output is then shared into the web database via W-Fi Module. This development consists of two types of Arduino which are Uno and Mega. Arduino Uno is used as the main board to read the sensor value. Figaro TGS 822 sensor is connected to an analog pin 0 with a 10k ohm resistor to create a voltage divider circuit. DHT11 sensor connected to digital input pin 10. Arduino Mega is used to connect with Wi- Fi Module ESP8266. Two different Arduino is used to communicate through the board because the gas sensor consumed quite a lot of power supply. If one Arduino Uno alone is used to connect between sensors and the Wi-Fi Module, the device might become unstable. Therefore, another Arduino which is Arduino Mega is used to connect with the ESP 8266 Wi-Fi Module as the Arduino Mega 2560 has 4 serial ports for UART communication. Since ESP8266 is driven by 3.3V thus it cannot be directly connected with Arduino because Arduino speaks in 5V . This has become another reason to connect the Wi-Fi Module with different Arduino so that the power supply for both sensors and Wi-Fi Module can be distributed separately. In order to connect ESP 8266 Wi-Fi Module with 3.3V power supply, it is not enough to only use the voltage regulator. Voltage divider is created to produce a voltage that sa fraction of the original voltage. An accurate reading of 3.3V from the circuit can be achieved by creating a voltage divider consisting 3 units of 1K ohm resistors.

RESULTS & DISSUSSSION

Ketone level is measured by collecting the breath acetone during exhalation. The overall prototype of this project consists of the main board of the system and a mouth piece contains FIGARO TGS 822 gas sensor and DHT11 sensor. The reading of ketone level displayed in the unit of mmol/l. On the display hardware. As the data is displayed, it will be recorded to the database for data collections. There are 4 important parameters that are displayed on the LCD. The stability of the gas sensor is depending on the value of humidity and temperature. Based on the observation, the sensor is stable at around 60% humidity and 28-29ºC. Therefore, the values of the humidity and temperature are hardcoded in order to get the scaling right without having to wait for DHT11.ketone level is displayed.

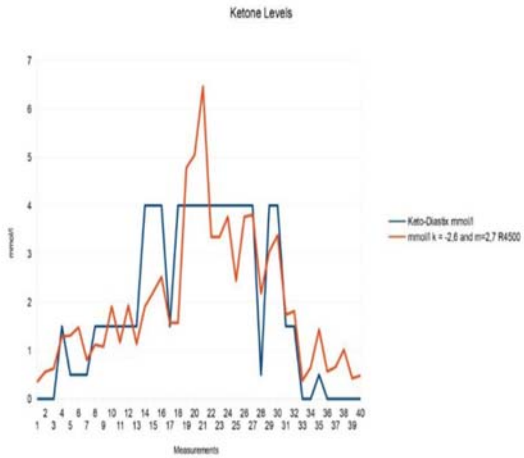


Fig 2. Comparison of the reading taken between breath acetone and Keto-Diastix

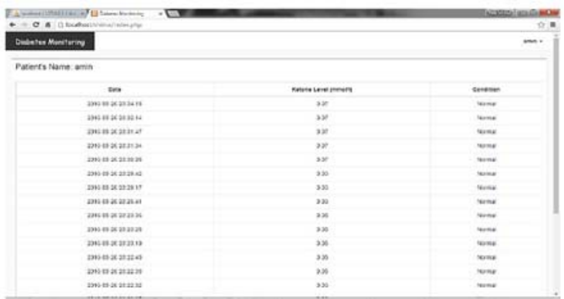


Fig 3. Results of Monitoring device

REFERENCES

[1]. A.S.(Eds). Feisul MI, National Diabetes Registry Report, vol. 1. Kuala Lumpur; Ministry of Health Malaysia; 2013 Jul., 2012.

[2]. R. L. Veech, “The therapeutic implications of ketone bodies: The effects of ketone bodies in pathological conditions” Prostaglandins Leukot. Essent. Fat. Acids, vol. 70, no. 3, pp. 309–319, 2004.

[3].L.Mackay and J. A. McKnight, “Ketone knowledge among people with type 1 diabetes,” J. Diabetes Nurs., vol. 14, no.8, pp. 304–307, 2010.