

# **IoT BASED NON-INVASIVE DETECTION OF BLOOD GLUCOSE LEVELS**

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**Abstract**— This paper aim is to design a non-invasive instrument to estimate the human blood sugar level within the body. In this article, the blood sugar level is obtained by the estimation of acetone resolvent present in the exhaled air of the person. The sensor device is used to convert the acetone resolvent level into voltage. Typically, the blood samples are taken by pricking the finger of the patient which is sort of painful. To avoid such diagnosing, we tend to project a replacement system which is painless for the patient and it is price effective.

**Keywords** – Blood glucose, Acetone, Exhaled Breath, Sensor, painful diagnosis, non-invasive.

## **I. INTRODUCTION**

Diabetes may be a condition that impairs the body's ability to method blood glucose, otherwise called blood sugar. According to the IDF Diabetes Atlas, there are currently 463 million peoples with polygenic disease worldwide. While not in progress, careful management diabetes will result in a buildup of sugars within the blood, which might increase the danger of dangerous complications, together with stroke and heart disease. High glucose level will result in several health disorders such as kidney failure, heart disease and even pre-matured death. Frequent testing and correct determination of glucose level for the diagnosing. Conventionally, glucose level is set by testing blood samples by finger puncture. This invasive method is relies on the principle where a thin needle is employed to prick the finger of the patient. To avoid such painful diagnosing, substantial analysis for developing non-invasive technique that measure the glucose level while not taking the blood sample.

There are 3 types of diabetes. Type1 is termed as Juvenile diabetes, largely developed in youngsters.Type2 is termed as Adult Onset Diabetes, affects folks of any age. Type 3 Gestational Diabetes develops in pregnant woman. There are different non-invasive procedures like NIR Spectroscopy, ultrasound and thermal spectroscopy analysis. But, the accuracy cannot verify due to dynamical environmental conditions. In this thing, the non-invasive diagnosing treatment is to determine blood glucose level from the estimation of breathe acetone.

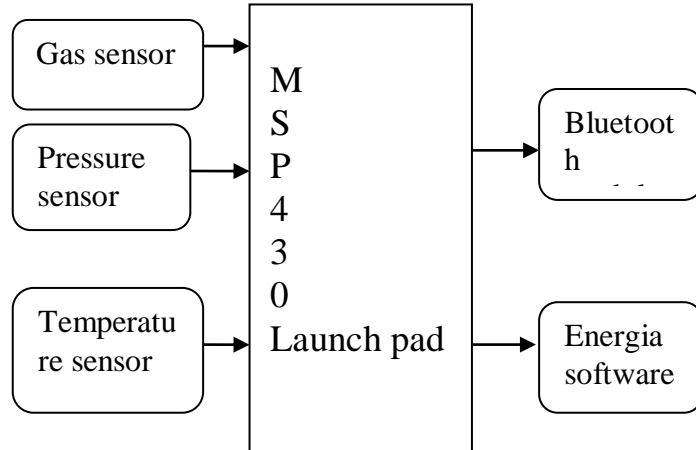
## **II. TECHNICAL BACKGROUND**

The technical background is predicated on the BREATHALYZER. The alcohol content of drunk person is detected by this instrument. The drunk person is asked to blow towards the blower and therefore the alcohol content in his body is displayed within the screen. The different systems listed within the references which can not evaluate the precise level. The blood sample is collected by puncture the finger of the patient which is painful diagnosing. The values are inaccurate and tends to relinquish incorrect answer.

## **III. THE PROPOSED MECHANISM**

The main objective of this project is to form Non-invasive breath Acetone Glucometer using MSP430.This microprocessor has sensible potency. This might overcome the difficulties present within the previous techniques of invasive ways. For analysis of glucose levels from the breath, we have a tendency to thought-about a complete of 5 parameters from 3 different device: Voltage and resistance from acetone sensor, pressure from Digital barometric pressure sensor and temperature & humidity from DHT11 sensor. A 215cm<sup>3</sup> was designed and three sensors were placed inside the mouth piece for analysis. Because of the presence of sensors inside the mouth piece the degree of this take a look at test chamber is taken to be around 200cm<sup>3</sup>.

**BLOCK DIAGRAM**

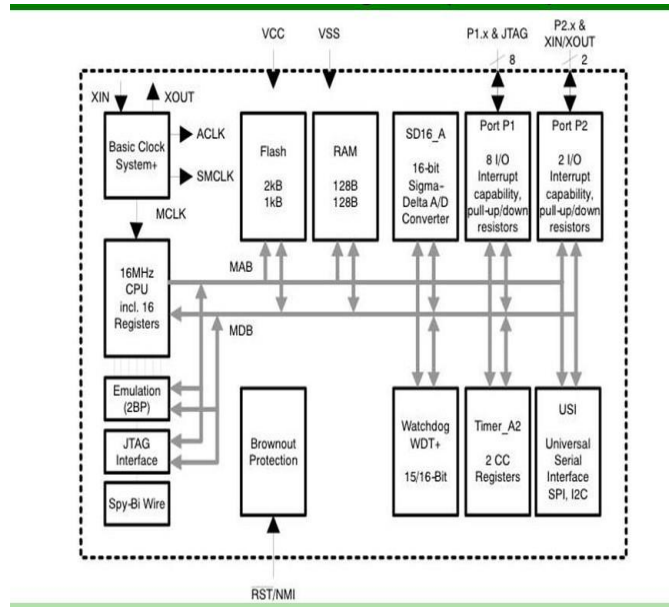


**PROPOSED SOLUTION**

The proposed system consists of  
 -Hardware setup  
 -Software setup

**Hardware setup**

A. MSP430 Launch Pad



The MSP430 controller is intended specifically for ultra-low-power applications. Its versatile continuance system, multiple low-power modes, instant wakeup and intelligent autonomous peripherals modify true ultra-low-power optimisation, dramatically extending battery life. MSP430 are extremely integrated and supply a wide range of high performance analog and digital peripherals.

**Bluetooth Module:**

The Bluetooth module used here is HC106. This module maybe a low power enabled shift used for the aim of wireless connection. It is connected to the acetone detector through the launch pad. The gas detector senses the acetone level and transmits the info of the launch pad wherever the glucose level and insulin intake level is calculated. These data are transmitted to the smart phone through the Bluetooth module.

**Gas Sensor:**

The gas detector detects the acetone level in our breath and assess the worth to the launch pad. It is a gas sensor having smart physical phenomenon towards acetone and different organic compounds. The conductivity of the sensor depends on the concentration of the acetone present.

**Hardware Implementation**

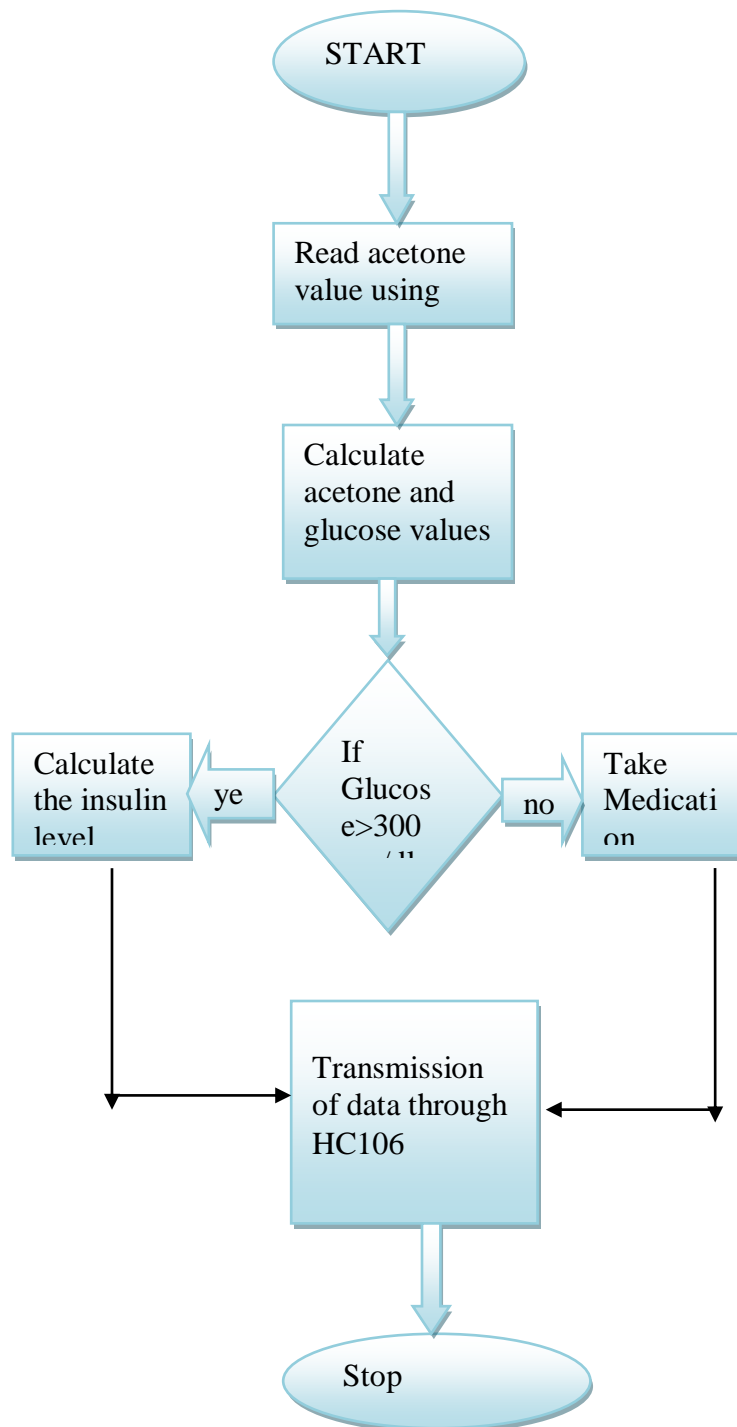
The acetone perceived from the mouth and also the gas is converted into voltage and is being programmed to show the glucose level and insulin intake values. The acetone concentrations are studied with and while not temperature impact. From the results, it is ascertained that voltage and resistance are taking part vital role in non-invasive glucose measurements. The patients blows his breath close to the gas sensor before he intakes his food. The data planned in launch pad is displayed within the smart phone through interfacing Bluetooth module. Since the patient is not affected by hyper diabetes, there is no need for insulin intake and solely medications is enough.

**Hardware setup:**

The glucose and insulin intake levels are displayed in the monitor by the acetone present in the mouth gas. The gas gets converted into the voltage and is programmed to display the levels. Temperature is no need to measure the acetone concentrations. The gas sensor is used to measure the acetone levels present in the person breathe.

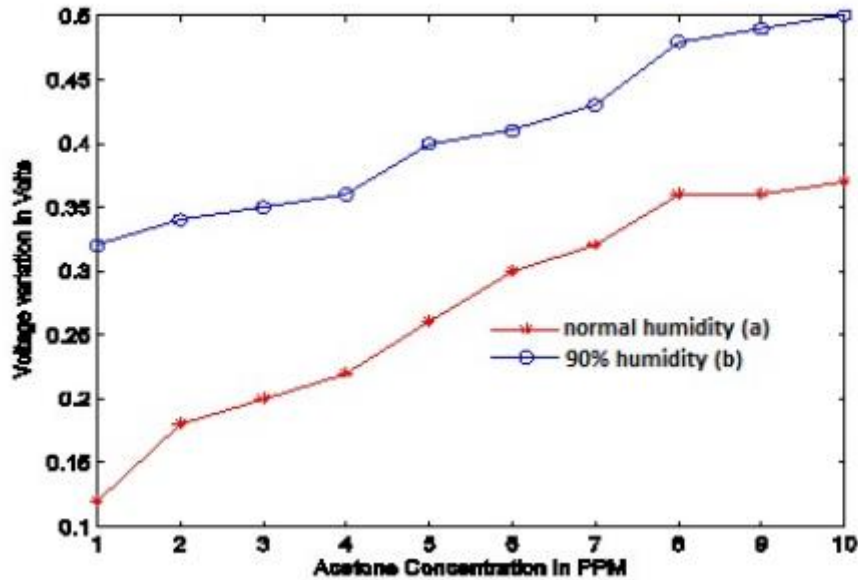
When the patient has high diabetic level, then they don't need insulin but they need only medications. Based on the presence of acetone level the insulin intake should varies.

**Flow Chart:**



#### IV. PERFORMANCE EVALUATION

The data processed in launch pad is displayed in the smart phone through interfacing the HC106 module. To get accurate results the temperature and humidity are to be considered where acetone values are changed on different climatic conditions.



#### V. CONCLUSION

In this paper, we designed and implemented a system to evaluate the concentration of glucose level in the body using programming which is developed in “Embedded C”. This system is quite useful for the measurement of glucose level with an accuracy of  $\pm 2\%$ . We used a gas sensor to sense the acetone in breath. With the help of programming using Embedded C in the MSP430 microcontroller, the glucose level is determined and it is displayed in smart phone.

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