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Monitoring the Glucose Level and Cholesterol Level Using IOT

Meghanachandrashekar¹, V.Indhumathi², R.Sowmiya³, K.Balachander⁴

U.G. Student, Department of Computer Engineering, Velammal Institute of Technology, Chennai,
Tamil Nadu, India^{1,2,3}

Assistant Professor, Department of Computer Engineering, Velammal Institute of Technology, Chennai,
Tamil Nadu, India⁴

ABSTRACT: Monitoring the health status of the patient at home is a difficult task. Particularly, old age patients should be periodically monitored and their loved ones need to be informed about their health status from time to time while at work. So in this paper is an innovative system that automated this task with ease. In this proposed system puts forward a smart patient health tracking application that uses sensors and microcontroller to track patient health and provides precautionary messages to the patient's mobile phone. In application system uses Cholesterol level as well as Blood glucose level to keep track of patient health. If system detects any abrupt changes in the patient's cholesterol or blood glucose level, the system automatically alerts the user about the patients status from the server in the hospital. Thus IOT based patient health tracking system effectively uses internet to monitor the health of the patient's heart and save lives to avoid emergencies.

KEYWORDS: Blood Glucose monitoring, Cholesterol level monitoring, Patient health tracking.

I. INTRODUCTION

The Internet of Things (IOT) is a concept reflecting a connected set of anyone, anything, anytime, anyplace, any service, and any network. The IOT is a megatrend in next-generation technologies that can impact the whole business spectrum and can be thought of as the interconnection of uniquely identifiable smart objects and devices within today's internet infrastructure with extended benefits. Benefits typically include the advanced connectivity of these devices, systems, and services that goes beyond machine-to-machine (M2M) scenarios [1]. Therefore, introducing automation is conceivable in nearly every field. The IOT provides appropriate solutions for a wide range of applications such as smart cities, waste management, structural health, security, emergency services, logistics, retails, industrial control, and health care.

Medical care and health care represent one of the most attractive application areas for the IOT [6]. The IOT has the potential to give rise to many medical applications such as remote health monitoring, chronic diseases, and elderly care. Compliance with treatment and medication at home and by healthcare providers is another important potential application. Therefore, various medical devices, sensors, and diagnostic and imaging devices can be viewed as smart devices or objects constituting a core part of the IOT. IOT-based healthcare services are expected to reduce costs, increase the quality of life, and enrich the user's experience.

In addition, the IOT can correctly identify optimum times for replenishing supplies for various devices for their smooth and continuous operation. Further, the IOT provides for the efficient scheduling of limited resources by ensuring their best use and service of more patients. It illustrates recent healthcare trends [7]. Ease of cost-effective interactions through seamless and secure connectivity across individual patients, clinics, and healthcare organizations is an important trend. Up-to-date healthcare networks driven by wireless technologies are expected to support chronic diseases, early

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diagnosis, real-time monitoring, and medical emergencies. Gateways, medical servers, and health databases play vital roles in creating health records and delivering on-demand health services to authorized stakeholders. Patients who are undergoing treatment for any chronic diseases need continuous monitoring i.e., post-treatment. This project helps those patients to take precautions to avoid emergencies with the help of blood glucose and cholesterol level. Blood glucose monitors are used to measure the amount of glucose in blood, especially of patients with symptoms or a history of abnormally high or low blood glucose levels [4]. Most commonly, they enable diabetic patients to administer appropriate insulin doses. Near Infrared Sensor is used as a non-invasive method to sense the Blood glucose level in the patient's body. BMI sensor is used to calculate the fat percentage in the patient's body. We carry two types of fat in our bodies: (i) essential fat which is stored in small amounts to protect the body. (ii) stored fat which is stocked for energy during physical activity. While too much body fat may be unhealthy, having too little fat can be just as unhealthy. Also, the distribution of body fat in men and women is different, so the basis for classifying the body fat percentage is different between the genders.

II. LITERATURE REVIEW

In Feb 2017, Evgeniia L. Litinskaia, Nikolay A. Bazaev, and Kirill V. Pozhar, "Methods for improving accuracy of non-invasive blood glucose detection via optical glucometer", as invented to methods for improving accuracy of non-invasive blood glucose detection via optical glucometer are discussed [1].

In Apr 2015, J. C. Pickup et al., "Real-time continuous glucose monitoring in type 1 diabetes: A qualitative framework analysis of patient narratives", as proposed to solve the problem to monitor the patient glucose level outside the hospital [2].

In Apr 2015, N. Demitri and A.M. Zoubir, "Estimating glucose concentration using a sparse scalable mean-shift algorithm", as invented to show that the scalable mean-shift algorithm results in a significant gain in computation time, while staying in the permissible accuracy range for glucose measurements [3].

In Sep 2013, N. Demitri and A.M. Zoubir, "Mean-shift based algorithm for the measurement of blood glucose in hand-held devices", as invented to estimate the glucose concentration from a very small blood sample in a novel hand-held measurement device [4].

In May 2012, S. Del Favero, A. Facchinetti, and C. Cobelli, "A glucose-specific metric to assess predictors and identify models", as proposed a new cost function, which overcomes this limitation and can be used in place of MSE for several scopes, in particular for assessing the quality of glucose predictors and identifying glucose models [5].

In Jan 2010, G.S. Cembrowski, J. S. Krouwer, "Review of standards and statistics used to describe blood glucose monitor performance", as proposed to estimate total error are parametric, nonparametric, modeling, or direct [6].

III. PROPOSED SYSTEM

The proposed system consists of a near infrared sensor and BMI sensor. The near-infrared sensor is used to obtain the glucose level of the person. The glucose level here is obtained without capturing the blood samples from human body. We also use the BMI sensor in order to obtain cholesterol level of the person. Here we pass a signal to the human body and wait for the receiving time of the signal at the other end. Based on the time we calculate the cholesterol level in human.

In this proposed system, considered as two parts – Software Application & Hardware kit. In software application will have the ability to monitor the patient's health continuously, particularly to measure the Blood Glucose level and Cholesterol level. In Hardware Kit consists of a Near – Infrared sensor and BMI sensor which continuously monitors the patient's health. The data from the sensor is continuously monitored and updated to the server using IOT module. In the case of abnormalities in either the Blood Glucose level or Cholesterol level, an alerting system is initiated and alert messages are sent to the Doctor and the patient's kin.

Solution for the complex problem as known as the blood glucose level is obtained based on the analysis performed with the help of blood. So here we make use of a feasible blood glucose estimation using Near-infrared sensor. The cholesterol level is also detected based on the BMI sensor.

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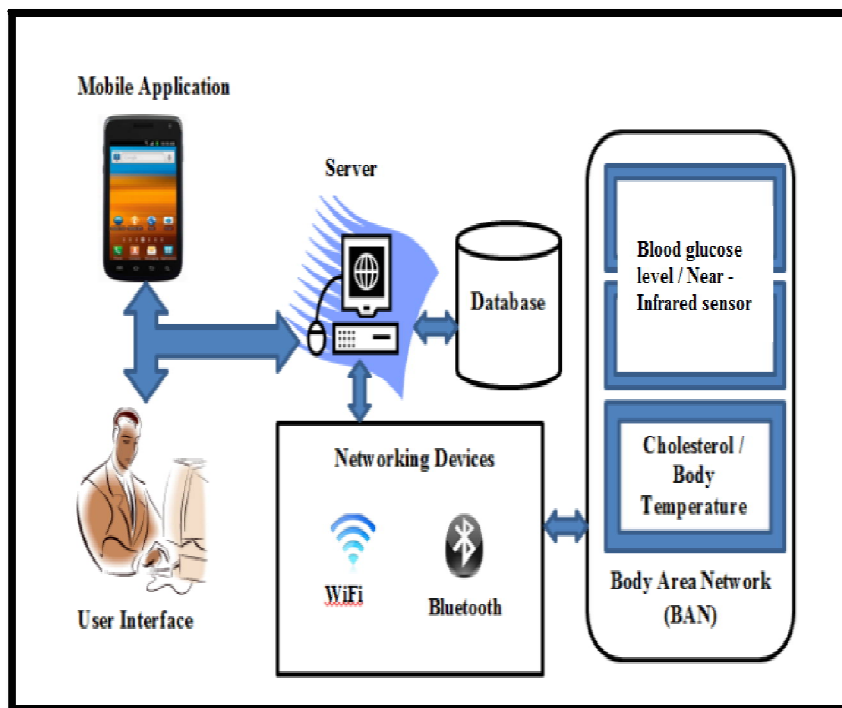


Figure-1: Patient health monitoring system

In microcontroller control the near infrared sensor(Blood glucose level) and Body mass index(BMI) sensor (cholesterol level),that is Body area network(BAN).In body area network connected to networking devices through Wi-Fi or Bluetooth. These devices continuously monitored and update about patient health to the server and stored in the hospital database. If any issue in the patient health the server can send the alert message to the patient and their family through mobile phones.

NEAR INFRARED SENSOR

Near Infrared transmittance spectroscopy is used across the ear lobe to measure glucose. Transmittance spectroscopy involves a light source and a light detector positioned on either side of the ear lobe. The amount of near infrared light passing through the ear lobe depends on the amount of blood glucose in that region. In this paper we use near-infrared sensor to calculate the blood glucose level of the patient.

BMI SENSOR

BMI is a "BODY MASS INDEX". Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI is a reliable indicator of body fatness for people. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat. BMI is used as a screening tool to identify possible weight problems for adults. Body fat serves as vital role in storing energy and protecting internal organs. Also, the distribution of body fat in men and women is different, so the basis for classifying the body fat percentage is different between the genders. The BMI160 is a small, low power, low noise 16-bit inertial measurement unit designed for use in mobile applications like augmented reality or indoor navigation which require highly accurate, real-time sensor data. In full operation mode, with the accelerometer and gyroscope enabled, the current consumption is typically 950 μ A, enabling always-on applications in battery driven devices. It is available in a compact 14-pin 2.5 x 3.0 x 0.8 mm³ LGA package." The

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BMI160 is also equipped with an integrated 1024 byte FIFO buffer that supports low-power applications and prevents data loss in non-real-time systems.

(A) PIC MICROCONTROLLER

The term PIC, or Peripheral Interface Controller, is the name given by Microchip Technologies to its single – chip microcontrollers. PIC micros have grown to become the most widely used microcontrollers in the 8-bit microcontroller segment. In this microcontroller have two sensors as near infrared sensor and BMI sensor in these two sensors used to monitor the blood glucose and cholesterol level of the patient.

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

(B) IOT MODULE

The internet of things (IOT) is the internetworking of physical devices, vehicles, buildings and other items-embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. Internet of Things (IOT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The IOT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.

IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet. The concept may also be referred to as the Internet of Everything. A thing in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. In IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input

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IV.RESULTS



Fig 1.1-Patient Monitoring

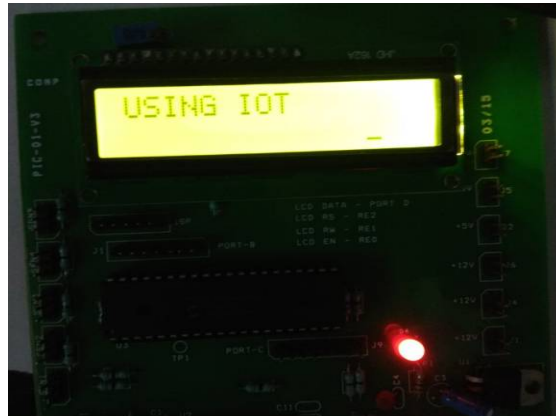


Fig 1.2-Using IOT



Fig 1.3-Cholesterol level monitoring

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In fig 1.1 explains the health monitoring to the patient in this purpose to check the health conditions of the patients. Hardware kit is used to monitor the patients health conditions. In fig 1.2 explains the IoT module it can be used to represent health of the patient. In fig 1.3 represents to monitor the cholesterol level of the patient. If the cholesterol level is high or low means immediately send the alerting message to the server. In this cholesterol level can be monitored using BMI sensor. The BMI sensor is used to obtain various physical parameters. Cholesterol level sensing is done by our system using BMI sensor.

V. CONCLUSION

In this proposed system aims at collecting the data from the sensors and updates it to the main server in the hospital. So, this process occurs irrespective of the presence of the doctor or the patient's relative beside the patient. The doctor can advise the patient to take any treatment by analysing the patient's health condition. The medical evaluation process can be made easier by this project using IOT technology and the patient can live a carefree life.

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