ISSN(Online) : 2456-8910
International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE)
Volume 2, Issue 11, DOI: 10.29027/IJIRASE.v2.i11.2019, 368-371 , May 2019

IOT-Based Wearable Smart Health Monitoring and Self Injection System

[1]Mr. Thiagyu, [2]Nikhilan Velumani, [3]Abhinav Kumar and [4]Karthik Pollusadu
Department Computer Science and Engineering
SRM Institute of Science and Technology, Chennai, India

***ABSTRACT** Studies have systematically shown that twenty percent to thirty p.c of medication prescriptions square measure ne'er stuffed, which close to fifty p.c of medicines for chronic illness don't seem to be taken as prescribed in keeping with a review in Annals of medicine. People who do take prescription medications — whether or not it's for an easy infection or a serious condition — generally take solely regarding 0.5 the prescribed doses. Add your third bullet point here. This lack of adherence is calculable to cause just about one hundred twenty five,000 deaths and at least 10 percent of hospitalizations. One of the major number of medications which are not taken time to time is diabetes. The number of individuals with polygenic disorder keeps increasing over consequent decade. Diabetes requires lifetime treatment in patients' daily life. Although several patients already apprehend that tight aldohexose management may be a essential issue of success for the standard of life, they still fail to observe their glucose level in actual clinical practice because of the frequent and painful finger stick tests.*

I. INTRODUCTION

IoT was first proposed by Kevin Ashton in 1999. It is a communication network within which physical objects square measure interconnected with one another or with larger systems. This network collects billions of knowledge from the terribly completely different devices we tend to use in existence and transforms them into usable information. There are about 20 billion devices in the world which interact with each other, and by 2025 it is estimated to go up to 75 billion . This shows that in the coming years cities that we live with IOT will become smart cities that will keep pace with the more paced and planned life . To make our life easier many opportunities will be offered by this change .E-health services are one of most important opportunities that are closely related to all of us . Day by day there is an rapid increase in the IOT applications in the health sector. Due to lack of Infrastructure people living in rural areas cannot benefit from preventive health services. Due to which deaths are very early in these places.

There is an rapid increase in the IOT applications in the health sector. In addition, with the speedy aging of the planet population, the wants of the senior always support square measure increasing with the amendment of family structure [9].

In addition to chronic cardiopathy, there's a high chance that the patient can lose his or her life as a results of excessive fatigue of the center during sleep at night, especially in Chronic Obstructive Pulmonary Disease (COPD) and Obstructive Sleep Apnea Syndrome (OSAS).The devices which helps in monitoring such cases are very expensive and sensitive, also it requires trained personal to use it. These wearable devices continuously measure the patient's heart values and, when a symptom of a heart attack has occurred, may send information about the patient's health condition to the family members and the doctor . HR and HRV are used primarily as a diagnostic tool for heart and non-cardiac diseases such as heart failure, aging, Parkinson's disease, diabetes. IoT is a new reality that completely changes our daily life. It is also a way to revolutionize modern health care by providing more personalized and preventive care.

There are many wearable health kits and devices which monitor the person's health continuously.

However real-time analyses and estimates, alarms , warnings on health hazards are not given in these devices. And also doesn't have a capability to take medication through the wearable time to time.

In this study, a wearable device is designed to read and measure vital values such as body temperature, glucose level, HR, HRV and CT, which mainly concerns about most of the diseases. The pulse sensor on device sends the heart related data, temperature sensor measures the temperature and the CGM sensor to detect the blood glucose level will be sent to the Arduino Pro Mini controller where the data will be analyzed. And the data will be sent to the user. And if the user sets a intake schedule of a particular medicine the band will automatically inject it during that time.

II. RELATED WORKS

The paper was mainly focused on diabetic control and monitoring but other chronic diseases such as heart attack, high fever etc. The main aim of the existing paper is to design automatic insulin injection systemwith Continuous Glucose Monitoring (CGM) signals which controls the insulin dosage automatically according to the real-time glucose

ISSN(Online) : 2456-8910
International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE)
Volume 2, Issue 11, DOI: 10.29027/IJIRASE.v2.i11.2019, 368-371 , May 2019

level, so that it can improve the quality of life for those who are suffering from diabetes. The current system we developed can also provide real time glucose data to the end user to manage the diabetes. The system can only detect the low level of insulin in the body and will automatically inject it. But this wont be helpful in detecting other disease. So its not that much optimized to use single band only for insulin purpose .

III. LITERATURE SURVEY

A .EXISTING SYSTEM

The paper was mainly focused on diabetic control and monitoring but other chronic diseases such as heart attack, high fever etc. The main aim of the existing paper is to design automatic insulin injection system with Continuous Glucose Monitoring (CGM) signals which controls the insulin dosage automatically according to the real-time glucose level, so that it will improve the quality of life for those who are currently suffering from diabetes or any such disease. The new system that we have developed can also provide real time glucose data to the end user to manage the diabetes. The system can only detect the low level of insulin in the body and will automatically inject it. But this wont be helpful in detecting other disease. So its not that much optimized to use single band only for insulin purpose.

B. PROPOSED SYSTEM

Our project is mainly focused on diabetic problem , chronic diseases such as heart attack, high fever etc control and monitoring system. It will consist of several sensors which will be used to detect various things such as heart beat rate, insulin level, temperature and etc. For example in case of a diabetic person if his insulin level goes down then the band will send a alarm of getting an insulin intake , the user can either take or override it , if the user doesn't responds then the band will automatically inject the insulin by default.

In another scenario if a person's heart beat increases rapidly and the temperature goes high and the band will compare all the measurements if it detects a chance of heart attack , it will alert the user and also send a SOS signal to all family members and also it will send the news in the social media and also make an arrangement for ambulance so that user's life can be saved

IV.ARCHITECTURE

In wearable smart health monitoring system ATMEGA 328 is used as microcontroller and HC_06 Bluetooth module is used for communication. The pulse sensor is used to collect physiological signals and the temperature sensor is used for BT measurement. Insulin level indicator is used to indicate the level of insulin in the body. Continuous Glucose Monitoring (CGM) signals which controls the insulin dosage automatically according to the real time glucose level. The pulse sensor measures the PPG signals that allow the calculation of heart-related values such as HR and HRV. This sensor is connected to the A0 analog input which converts 10 bits of the ATMEGA 328 controller. The Negative Temperature coefficient (NTC) temperature sensor used for BT measurement is connected to A1 analog input of the controller. Due to its cheap, stable and small structure, it is preferred in most sensitive temperature measurement applications. Amazon Web Services has a trained Machine Learning model stored in the cloud and the microcontroller will provide the data of different parameters like temperature, heart rate and insulin level. The data will be run through the trained ML model. According to this model, disease will be identified.

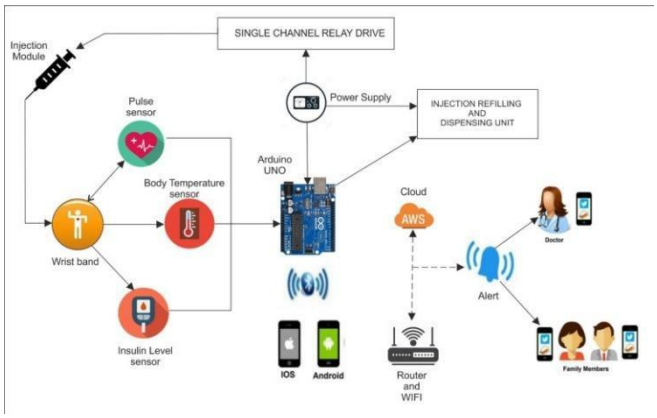


FIG4.1 SYSTEM ARCHITECTURE

V. MODULE DESCRIPTION

5.1 TEMPERATURE SENSOR

The body temperature will be measured by DS1820 digital thermometer sensor, which provides 9 bit Celsius temperature measurements. The sensor will communicate the temperature information to the microcontroller.

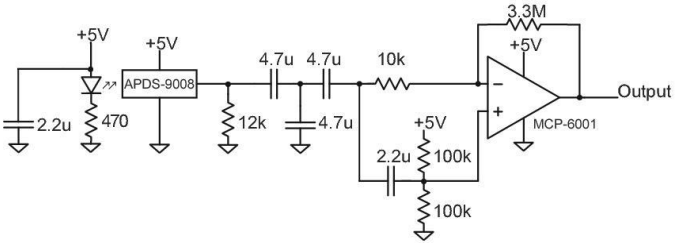
FIG 5.1.1: DS1820

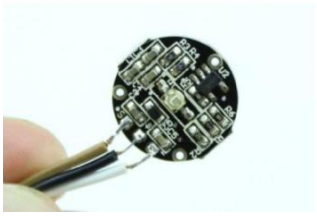
SENSOR 5.2 PULSE SENSOR

The pulse sensor (SO00837PS) detects the heartbeat by the reflection of green light emitted. In FIG5.2.1 shows the circuit diagram of the sensor. The high frequency noise signals are cleared by the low pass filter used at the output.

ISSN(Online) : 2456-8910
International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE)
Volume 2, Issue 11, DOI: 10.29027/IJIRASE.v2.i11.2019, 368-371 , May 2019

The signal is then amplified by the OP-AMP. The light emitted by the green LED in Fig is reflected back to the light sensor in every heartbeat, depending on the oxygen saturation in the finger blood. This sensor responds to variations in light intensity and the amplitude of the output signal depends on the amount of light.





(a) (b)

FIG5.2.1 SO00837PS sensor (a)Back side (b) front side

5.3 GLUCOSE SENSOR ARDUINO

A glucose Sensor is an electrochemical strip which oxidizes glucose enzymes. The INA219 module converts the signals from the glucose sensor into voltage interfaces which is then given to the Arduino UNO .

FIG 5.3.1:GLUCOSE SENSOR

The dataset is analyzed thoroughly for the objective of achieving an intuition for where the machine learning (ML) model being trained in the later stages may detect a pattern.

5.4 ARDUINO UNO MICROCONTROLLER

The Arduino UNO is a low cost 8-bit microcontroller. Due to its small size it is always preferred in battery operated and portable applications. It consists of ATmega328p microcontroller. It has 14 Digital pins, 6 analog pins which are programmable. It accepts voltage upto 9v and frequency of 16MHz.

Fig5.4.1: Arduino UNO Microcontroller

5.5 AWS(AMAZON WEB SERVICES)

We will be using AWS for communicating and storing necessary information on the cloud server.

It will be linked with the application and in case of any emergency situation the server will send the message automatically to the doctor and to close friends. It will also consists of the Disease detecting algorithm, which will predict the disease according to the various input parameters.

FIG5.5.1: AWS logo

5.6 HC-05 BLUETOOTH MODULE

Bluetooth is a communication protocol by which two devices interchange information within a distance of 10-20 meters. It uses the bandwidth of 2.4-2.48GHz.

The HC-05 is an easy to use Bluetooth SPP(Serial Port Protocol) module, designed for wireless serial communication.

FIG 5.6.1:

HC-05 BLUETOOTH MODULE

VI. CONCLUSION

Wearable technology may soon become a valuable tool in the manufacturing workplace, and one that can deliver a number of significant benefits. For example, if implemented correctly, wearable technology can change the course of the fact that how wearable technology can help save ones life. We need to consider the variety of factors that can affect meter accuracy and interpret glucose meter results with regard to the .potential for meter interference, questioning glucose meter results whenever the results do not match the clinical scenario. Unusual sensations such as a cold sweat, nausea, vomiting, lightheadedness, or dizziness. Women are more likely than men to experience these kinds of symptoms. The wearables are then future with the amount of benefits they provide which includes that it can save someone's life.

VII. REFERENCES

1. Ashton, K, That 'internet of things' thing, RFID journal, 2009, 22(7), 97-114.

2. Gubbi, J., Buyya, R., Marusic, S., Palaniswami, M, Internet of Things (IoT): A vision, architectural elements, and future directions, *Future generation computer systems*, 2013, 29(7), 1645-1660.

3. Evans, D., The internet of things: How the next evolution of the internet is changing everything, *CISCO white paper*, 2011, 1, 1-11.

4. Zanella, A., Bui, N., Castellani, A., Vangelista, L., Zorzi, M., Internet of things for smart cities, *IEEE Internet of Things journal*, 2014, 1(1), 22-32.

5. Ejaz, W., Naeem, M., Shahid, A., Anpalagan, A., Jo, M., Efficient energy management for the internet of things in smart cities, *IEEE Communications Magazine*, 2017, 55(1), 84- 91.

6. Rahmani, A. M., Gia, T. N., Negash, B., Anzanpour, A., Azimi, I., Jiang, M., Liljeberg, P., Exploiting smart e-Health gateways at the edge of healthcare Internet-of-Things: A fog computing approach, *Future Generation Computer Systems*, 2018, 78, 641- 658.

7. Thibaud, M., Chi, H., Zhou, W., Piramuthu, S., Internet of Things (IoT) in high-risk Environment, Health and Safety (EHS) industries: A comprehensive review, *Decision Support Systems*, 2018, 108, 79-95

8. Ayón, C., Unpacking Immigrant Health: Policy, Stress, and Demographics, *Race and Social Problems*, 2018, 1-3.

9. Chaudhary, R., Jindal, A., Aujla, G. S., Kumar, N., Das, A. K., Saxena, N., LSCSH: Lattice-Based Secure Cryptosystem for Smart Healthcare in Smart Cities Environment, *IEEE Communications Magazine*, 2018, 56(4), 24-32.

10. Abdullah, A., Ismael, A., Rashid, A., Abou-ElNour, A., Tarique, M., Real time wireless health monitoring application using mobile devices, *International Journal of Computer Networks & Communications*, 2015, 7(3), 13-30.

11. Kakria, P., Tripathi, N. K., Kitipawang, P., A real-time health monitoring system for remote cardiac patients using smartphone and wearable sensors, *International journal of telemedicine and applications*, 2015, 8.

12. Goldberger, A. L., Amaral, L. A., Hausdorff, J. M., Ivanov, P. C., Peng, C. K., Stanley, H. E., Fractal dynamics in physiology: alterations with disease and aging, *Proceedings of the national academy of sciences*, 2002, 99(1), 2466-2472.

13. Majumder, S., Mondal, T., Deen, M. J., Wearable sensors for remote health monitoring, *Sensors*, 2017, 17(1), 130.

14. Saha, J., Saha, A. K., Chatterjee, A., Agrawal, S., Saha, A., Kar, A., Saha, H. N., Advanced IOT based combined remote health monitoring, home automation and alarm system. In Computing and Communication Workshop and Conference, IEEE 8th Annual, 2018, pp 602-606.

15. Kalid, N., Zaidan, A. A., Zaidan, B. B., Salman, O. H., Hashim, M., Muzammil, H., Based Real Time Remote Health Monitoring Systems: A Review on Patients Prioritization and Related" Big Data" Using Body Sensors information and Communication Technology, *Journal of medical systems*, 2018, 42(2), 30.

16. Walinjkar, A., Woods, J., Personalized wearable systems for real- time ECG classification and healthcare interoperability: Real- time ECG classification and FHIR interoperability, *In Internet Technologies and Applications*, 2017 , pp 9-14.

17. Patel, S., Park, H., Bonato, P., Chan, L., Rodgers, M., A review of wearable sensors and systems with application in rehabilitation, *Journal of neuroengineering and rehabilitation*, 2012, 9(1), 21.

18.https://en.wikipedia.org/wiki/Lance_Armstrong

19. Yang, Z., Zhou, Q., Lei, L., Zheng, K., Xiang, W., An IoT-cloud based wearable ECG monitoring system for smart healthcare, *Journal of medical systems*, 2016, 40(12), 286.

20https://www.murata.com/~/media/webrenewal/support/library/catalog/products/thermistor/ntc/r44e.ash