INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 2)
Available online at: www.ijariit.com

IoT for monitoring diabetic patients

R. Vasanthakumar
vrvasanthan6@gmail.com
Periyar Maniammai Institute of Science and Technology, Thanjavur, Tamil Nadu

K. D. Darsini
dharshini0906@gmail.com
Periyar Maniammai Institute of Science and Technology, Thanjavur, Tamil Nadu

S. Subbaiah
iampossiblevk@gmail.com
Periyar Maniammai Institute of Science and Technology, Thanjavur, Tamil Nadu

Dr. K. Lakshmi
lakshmi_tamil@hotmail.com
Periyar Maniammai Institute of Science and Technology, Thanjavur, Tamil Nadu

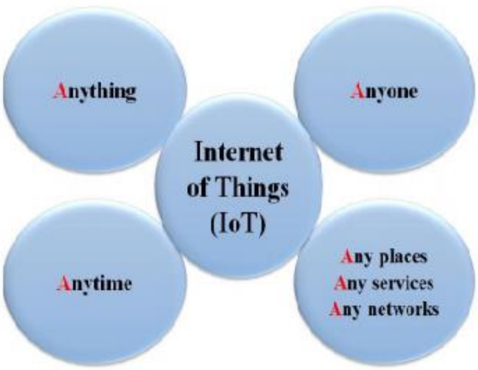
ABSTRACT

Diabetes is the most common disease in the world which will lead to death when there is no proper health care. Failure to control the disease not only results in long-term complications but also affects the life of the patients. If the glucose level is monitored day-by-day, it will help the patient to manage their health properly. The feedback information regarding their sugar level is helpful for the patient to take care of the health daily. In this paper we discuss about the system that is designed to monitor the glucose level, blood pressure and temperature of the person. By making the data available in cloud, it can be used by the doctors to get the historical data. This will help better health care management of their patients. This system is implemented by using the Raspberry Pi for reading data from the user. The ADC is also used to convert the analog signal into the digital signals. The project implementation details are discussed in this paper.

Keywords: *Health, Monitoring, Diabetes, Disease, Patient, IoT.*

1. INTRODUCTION

The Internet of Things (IoT) sometimes referred to as the Internet of Objects, will change everything including ourselves. The Internet has an impact on education, communication, business, science, government, and humanity. Clearly, the Internet is one of the most important and powerful creations in all of human history and now with the concept of the internet of things, internet becomes more favourable to have a smart life in every aspect. In the near future, storage and communication services will be highly pervasive and distributed: people, machines, smart objects, surrounding space and platforms connected with wireless/wired sensors, M2M devices, RFID tags will create a highly decentralized resources interconnected by a dynamic network of networks. By developing the IoT technology, testing and deploying products it will be much close to implementing smart environments by 2020.



Blood glucose monitoring can help a person to keep their glucose levels within a specified target range by balancing food, exercise and insulin, thus reducing the chances of diabetes complications. A range of testing and monitoring equipment is available to help people manage their diabetes. This paper proposes a system that monitors the patient's glucose level and also store that in cloud. Both the patients and the doctor can get the historical and current data for better decision making on the medication and diet.

2. RELATED WORKS

Prabha Sundaravadivel *et.al.* discussed about the Connected health which refers to any digital healthcare solution that can operate remotely, with additional components of continuous health monitoring, emergency detection and can alarm capabilities. They have using WBAN network for connectivity, which is not efficient to make readings for movable sensors. The WBAN is demerit by Wired network restriction between the body movements. It lack of integration sensors.

Ahmed Abdelgawad *et. al.* have discussed about the Remote healthcare for senior citizens. The autheors described, Health monitoring, rehabilitation, and assisted living for the elderly and medically challenged humans is an emerging challenge as they require seamless networking between people, medical instruments, and medical and social service providers. They propose a portable and customizable IoT system that can be used to collect the data needed to facilitate the independent living of senior and challenged citizens to improve their quality of life. They have used Raspberry Pi 2 microcontroller for reading the patient's data. The Pi 2 had a 900MHz Cortex-A7 chip, but the Pi 3 has a 1.2GHz Cortex-A53. Running the Whetstone Pi A7 test, the Pi 3 scored 711 compared to the Pi 2's 432: a 65% increase to perform the action between boards to network.

Suhail N. Abood proposed the patient monitoring by the mhealth. The self management of diabetic patients is monitor by the patient and doctor interactions. The connectivity is done by the GSM networks, sensors are connected with an n number node of mobile devices and the patient readings will be upload to the cloud storage. The doctor will give the brief summary about the patients like diet, exercise etc. The authors have suggested using Bluetooth to share the patient's readings with the device which they connected. But we propose to use UART for collecting the reading to raspberry pi, that is easy way of sharing the data. And they have done GSM network for upload the data to cloud. We are using WIFI for a upload session, it enabling high-speed transmit between sender and receiver.

Ghulam Muhammad et.al, have suggested a better solution for the uninterrupted, secured, seamless, and ubiquitous framework for the iot monitor the patients. The IoT related to capturing voice, body temperature, electrocardiogram, and ambient humidity is used. They exclude devices such as laryngoscope and stroboscope because they are difficult for a patient to operate.

3. SYSTEM ARCHITECTURE

A. DESIGN

The architecture defines a whole design and execution of the patient monitoring system. The mandatory sensors are connected into a arduino nano microcontroller. The arduino microcontroller is connected with Raspberry Pi 3. Raspberry pi and cloud were connected by a WIFI, the below architecture figure shown in *(fig 1.system architecture)* In our paper we propose the IOT based health monitoring for the diabetes patients. The common way of monitoring is not compatible for all peoples, some of peoples they are moving to a internet world. So that we done this idea for a future execution. The doctor will monitor the patients by day to day monitoring. We collect the health readings by the sensors and that data all are transmit into a raspberry pi. From there we upload to cloud storage.

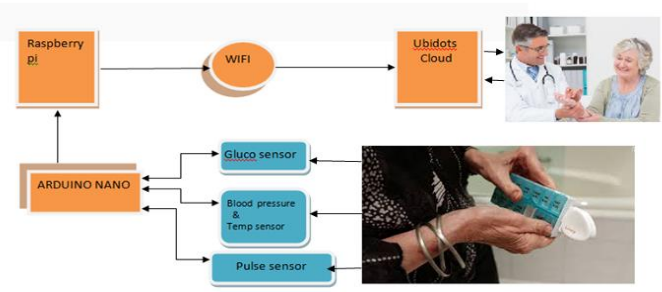


Fig 1. System architecture

The glucose, pulse, temperature, blood pressure sensors are connected into an ARDUINO NANO microcontroller for the purpose of analog to digital conversion. And we transmit the patient's data reading by a UART USB cable to Raspberry Pi 3. The Raspberry Pi 3 contains all data collections and sends to the cloud storage ubidots.

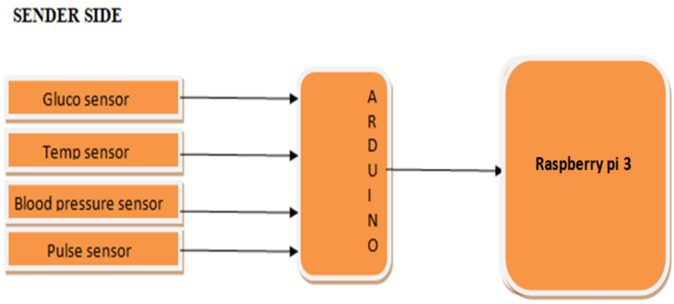


Fig 2. Sender side

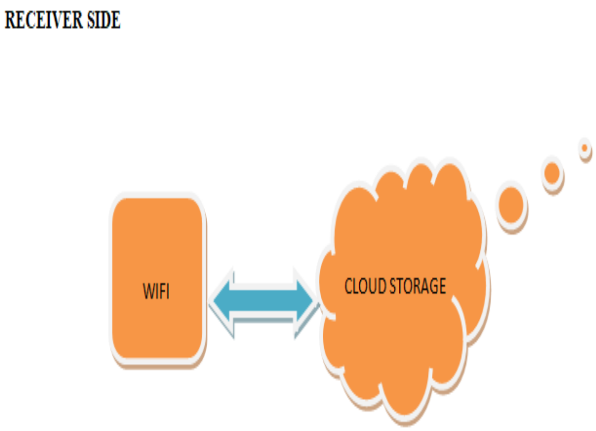


Fig 3. Receiver side

The sender side will collect the readings by the arduino about the patients and transmit to the raspberry pi. The sender and receiver side pictorial representation shown below in (*fig 2. Sender side* and *fig 3. Receiver side)* The receiver side collects the read data by WIFI through Raspberry Pi and store into cloud storage.

B. Hardware Components and Working Principle

In this project we choose to measure the blood sugar level, pulse, blood pressure and temperature. These glucose sensor, blood pressure and temperature sensor, pulse sensor are connected into the arduino nano ADC. The arduino nano connected through the USB cable to raspberry pi. The Raspberry Pi is connected with the cloud through the WIFI.

C. SENSORS

Here we have given the details of the sensors we have used in our project.

a) ONE TOUCH GLUCO MONITOR:

Fig4.onetouch glucose monitor

It is simple to use. It has sound alerts with colour and audio alerts. It is a realtime product,in this project we used for gluco monitoring by get its analog values. *(Fig 4. onetouch glucose monitor)* we use this onetouch real-time product for getting the glucose level of the patients. We get the analog unit and powersupply from there we get the analog to digital value by arduino nano.

b) PULSE SENSOR

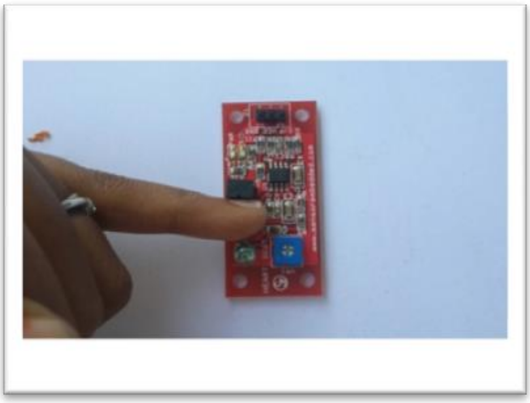


Fig 5.pulse sensor

The pulse sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region).The pulse reading of the patient is read by infrared lighting by center the finger sensing . (Fig 5.pulse sensor)

c) TEMPERATURE AND BLOOD PRESSURE SENSOR:

Fig 6.blood pressure and temperature sensor

A pressure sensor is a device which senses pressure and converts it into an analog electric signal whose magnitude depends upon the pressure applied. Since they convert pressure into an electrical signal, they are also termed as pressure transducers.

A temperature sensor is an integrated circuit, and can therefore include extensive signal processing circuitry within the same package as the sensor. There is no need to add compensation circuits for temperature sensor Ics. This sensor is used to measure the blood pressure and temperature of the patients. (Fig 6.blood pressure and temperature sensor)

D. RASPBERRY PI 3:

Fig 7.raspberry pi 3

The Raspberry Pi board comes equipped with an SD card. This slot permits us to insert an SD card and that can use it as our devices. The SD card is a main storage device for Raspberry Pi board like a hard disk of a personal computer. The bootable Linux operating system is loaded onto the card, you are planning to use. The Raspberry Pi supports Linux, Qtonpi, ARM, Mac operating systems.

You can select one OS; you will need to write it to an SD card using a Disk manager application. You can also use other storage mechanism, like USB external hard drive or USB drive.The raspberry pi 3 connected with a wifi. (Fig 7.raspberry pi) .we using this Raspberry Pi controller for uploads the data readings of the patients into a cloud.

E. ARDUINO NANO:

Fig 8.arduino nano

An Arduino is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature. It is basically used in communications and in controlling or operating many devices. (Fig 8.arduino nano). We are using this arduino for analog to digital conversion of the data.

F. Software Components:

We have using arduino IDE for program, mobaXterm for virtual window of raspberry os.

ARDUINO IDE:

Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer. In our project we are using this ide for converting analog values into digital.

We use the arduino ide for collecting the data from the patients by declare some variables and setup(),loop() in python or c programming.

MOBAXTERM:

MobaXterm is an enhanced terminal for Windows with an X11 server, a tabbed SSH client and several other network tools for remote computing (VNC, RDP, telnet, rlogin). MobaXterm brings all the essential UNIX commands to Windows desktop, in a single portable exe file which works out of the box. We use this mobaxterm for access the raspberry pi 3 by a virtual monitor and terminal access.

4. IMPLEMENTATION

1, Data collection to the patients:

The patient's readings are collecting by the sensor which we using glucose, pulse, blood pressure, temperature sensors to the patients from wherever in the world to the physicians, and that data all are transmit by the arduino nano. The arduino nano contains reading by analog value and transfer the readings by the UART protocol using USB cable to the Raspberry pi.The Raspberry pi will store the patient readings through the wifi to cloud storage. The physician can view the patient's data from the cloud and give the feedback to the patients via the same module.

2, Data saving to the cloud:

The reading values are simultaneously uploaded to the ubidots cloud storage. There are three steps involved in data storage,

i) Send data: Devices are created automatically upon reception of the first data points. use device types to pre-configure our properties.

ii) Get data: Retrieve data for late processing

iii) Parse data: Alternatively, use ubiparsers to code our own API in a few lines of javascirpt, enabling data ingestion and delivery using own format

Ubidots:

Ubidots focuses on key inputs to deliver our right tools and in timely fashion to see our solution succeed.despite inevitable setbacks, they rise to the occasion and never settle for adequate, always working to make our data more valuable.

Need of ubidots:

Ubidots value-add in development time and cost saved is only increased when combined with its usability. With a core architecture focused on data efficiency and an engaging UX (user experience),ubidots users can connect, build, and deploy cloud IOT applications with ease, leavings Ubidots to handle the cloud end-user UX infrastructure.

The activities on ubidots:

1) Creating unique id for a patients
2) Creating devices for the treatment
3) Creating variables for the sensors
4) Overall data viewing by the patient and doctor

I. Creating unique id for a patients:

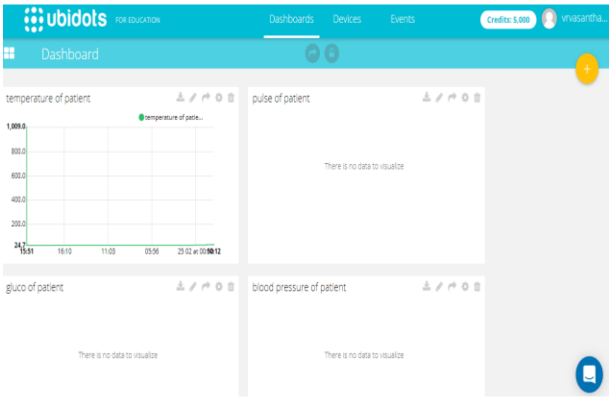


Fig 9.id creation

The doctors will give the unique id to the patients by ubidots. So the doctors will easily identify the patient interaction without confusion. Both doctor and patients can visit there historical moments. The id picture shown below (*fig 9.id creation*)

II. Creating Devices for the Treatment

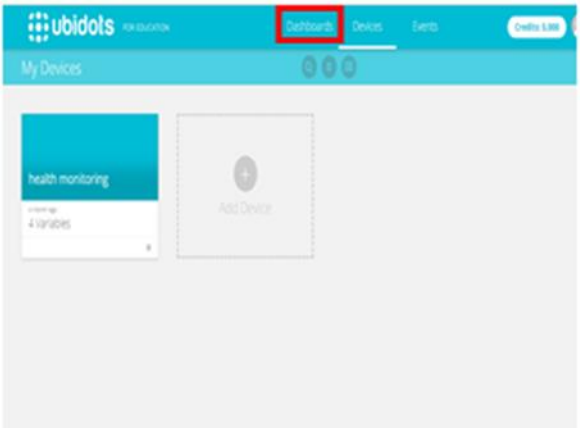


Fig 10 .device creating

The doctor wants to create one device for what is the treatment process for the patient. In our project we have using health monitoring device to represent the title. If we want to make a change on that device can delete or rename the device names. The device is containing description of the device, API label, API id, last activity, tag of the device. The device creating picture shown below (fig *10.device creating).*

III. Creating Variables for the Sensors:

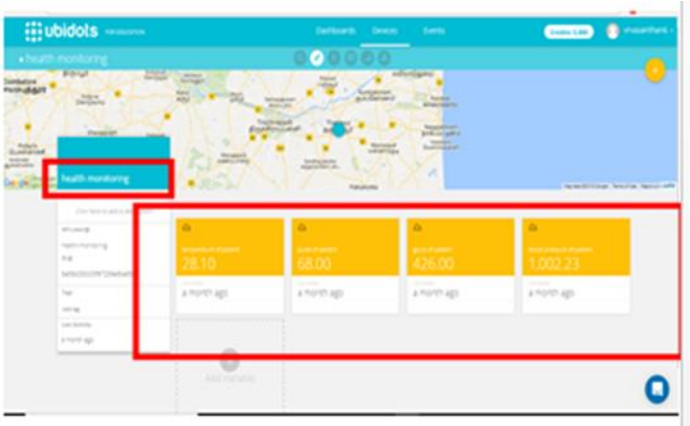


Fig 11.variable creating

Here we create the variables for our sensors by separate section the variable have different id for API.

The variable creating picture is shown below (*fig 11.variable creating*).

We have created following variables for the device:

a) Temperature variable *(Fig 12.Temperature variable)*

b) Pulse variable *(Fig 13. Pulse variable)*

c) Glucose variable *(Fig 14. Glucose variable)*

d) Blood pressure variable *(Fig 15. Blood pressure variable)*

The variables are contains historical and current data about the patients

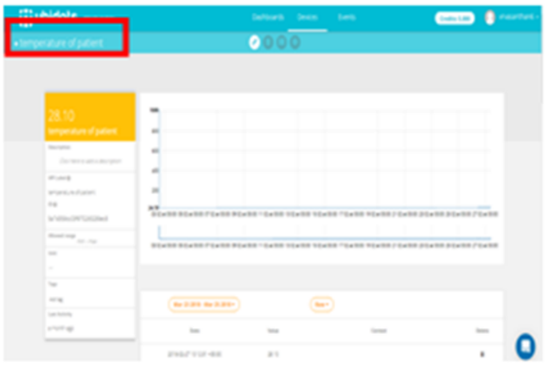


Fig12.Temperature variable

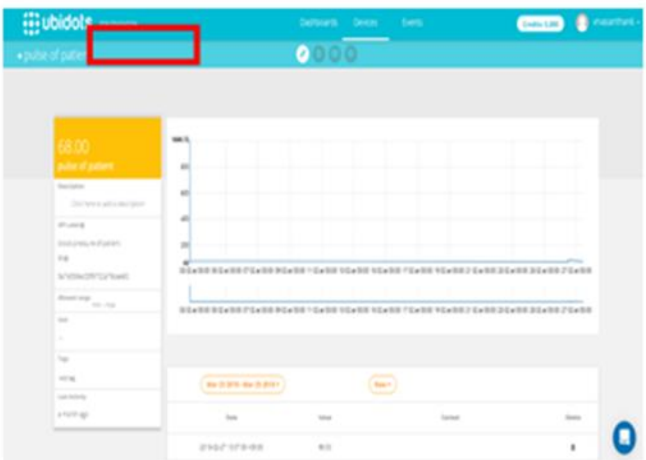


Fig 13. Pulse variable

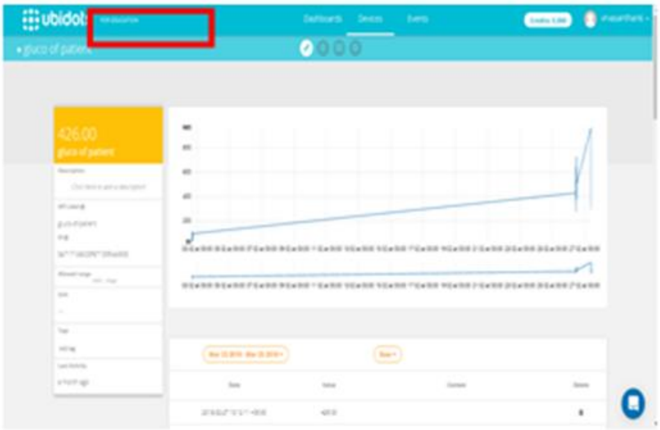


Fig14. Glucose variable

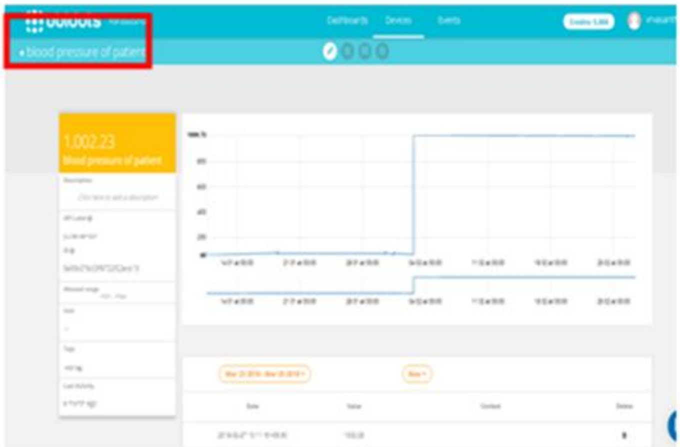


Fig 15. Blood pressure variable

IV. Overall data viewing by the patient and doctor:

The overall data is view by the dashboards which we create by graph and bar charts. The overall data viewing picture is shown below (*Fig 16. Overall view of reading).*

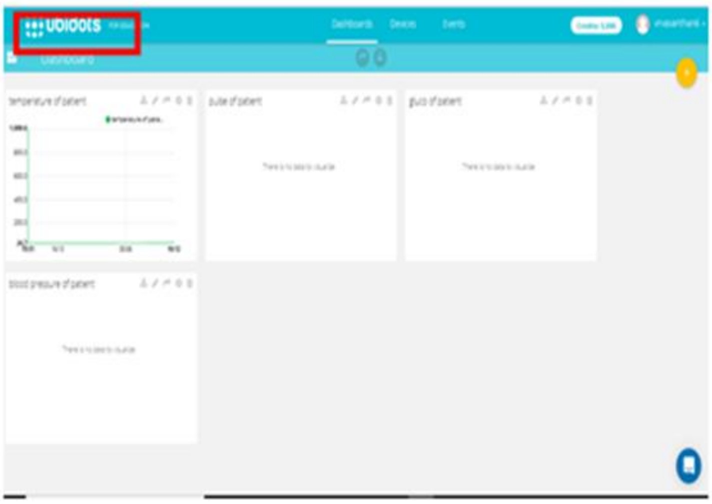


Fig16. Overall view of reading

5. CONCLUSION

This paper presented an IOT based health monitoring approach to diabetes self management with the goal of multi dimensional aspects of treatment, shifting the emphasis from a traditional clinician-centered approach to a patient centered one. The main contributions of this work are the new architecture and development of a platform to support a new multidimensional approach for diabetes care. The main contributions of this work are the new architecture and development of a platform to support anew multidimensional approach for diabetes care. The overall kit for monitoring diabetic's patients is shown following fig 17.overall kit

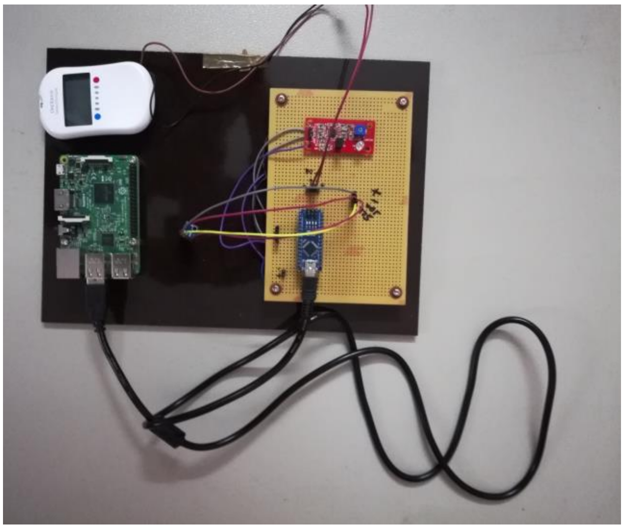


Fig17. Overall Kit

6. REFERENCES

[1] Majid A. Al-Taee, Waleed Al-Nuaimy, Ali Al-Ataby, Zahra J. Muhsin Department of Electrical Engineering and Electronics University of Liverpool, Liverpool, UK
[2] Evaluating the different technologies and components of the Internet of Things for better health By Prabha Sundaravadivel, Elias Kougianos, Saraju P. Mohanty, and Madhavi K. Ganapathiraju
[3] Internet of Things Applications, Challenges and Related Future Technologies, Elmustafa sayed ali ahmed Red Sea University
[4] IoT-Based Health Monitoring System for Active and Assisted Living, Ahmed Abdelgawad, Kumar Yelamarthi1(&), and Ahmed Khattab
[5] A context aware, interactive M-health system for diabetes Shih-Hao Chang, Rui-Dong Chiang, Shih-Jung Wu,and Wei-Ting Chang, Tamkang University of Taiwan
[6] Smart Health Solution Integrating IoT and Cloud: A Case Study of Voice Pathology Monitoring ,Ghulam Muhammad, SK Md Mizanur Rahman, Abdulhameed Alelaiwi, and Atif Alamr

