European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 7, Issue 5, 2020

IOT ENABLED HEALTH-CAREFOR SENIOR CITIZENS USING FOG COMPUTING

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ABSTRACT

The IoThealth-care supporting for disabled peoples is an important milestone in technological advancement. In this paper, it is developed a mobile Health-care app, called M-Health, on the system using iPhone with smart Apple watch to help seniors to manage their health life. The proposed M-Health measures the heart rate and notifies to emergency contacts, when it is abnormal. The notification can be a call, SMS, email, or a combination of them. The M-Health suggests the users to take optimum dosage of medicine. This reminds the users to move out for a walk and suggests to perform optimum exercise.Also, it records, heart rate of a patient and sends to the physician periodically. Simulation results shows that, it is beneficial with better performance in avoiding end-to-end delay, resulting excellent throughput of achieving the goal of serving the health-care to the blind, disabled and elderly peoples in time. The results also shows that it is less prone to failure addressing probability of fog computing in IoTenvironment.

Keywords: RFID; Medical Care; Patient Monitoring; Raspberry Pi; Wireless sensors.

1. Introduction

The basic technical knowhow of IoT project deals with identification, management, allocation, sharing and implementing of available resource to get better solutions with right perspective for health-careto the elder peoples utilising Aged Patient Monitoring System (APMS). The speed of web arrangements with more intentional pace required for appropriate long haul asset arranging.The IoT is built on the concept to connect things and devices. The information can easily pass between different devices at different environment, while offering effective services. The edge devices can able to do these operations perfectly in a semi-automatic form and sometimes, minor human intervention may be required. This can be performed at real-time smoothly even at remote places. TheAPMS, during patient'svital health condition, smart embedded intelligent edge devicesconnected with WiFi of 3G/4G, communicates smoothly. These edge devices generate large amount of data, allows to provide better conclusion by means of machine learning algorithms.

The idea behind cloud computing is Every-thing as a Service (XaaS) is to share resources which are at different locations to offer services to consumers in an efficient manner. There are four significant assistance models: 1. Framework as-a-Service (IaaS), 2. Stage a-Service (PaaS), and 3. Programming as-a-Service (SaaS), and 4. Desktop Work area as a Service (DaaS).These system are connected by decentralized nodes, the nodes can interact, as a cyber physical systems. The various service providers are shown in Figure 1.

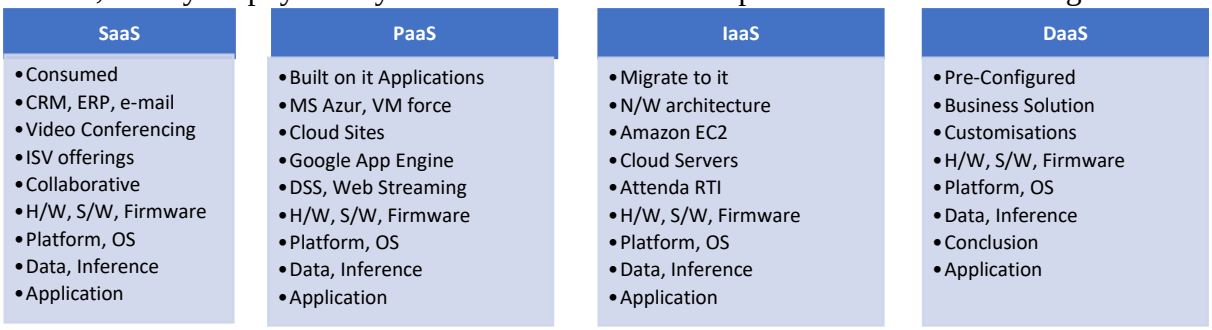

Figure 1. Types of Cloud Computing

1.1 Elderly people's Health-care

The elder peoples may have confined chronological disease of symptoms such as hyper-tension, arthritis, heart disease, syndromes, minor accidents and illness than youth. The distinguishing traits of historical aged person's health may affect bodily and mentally. A crucial sign of antiquated age that impacts everybody and thought is "gradualness of conduct". This "hindering guideline", finds a relationship between's propelling age and gradualness of human body physical wellness.Thisphysical fitness issues of elder peoples can be measured with smart edge handheld gadgets, like smart watch, smart devices precisely and can be transmitted to health practitioner for acceptable medication, as proven in the Figure 2.

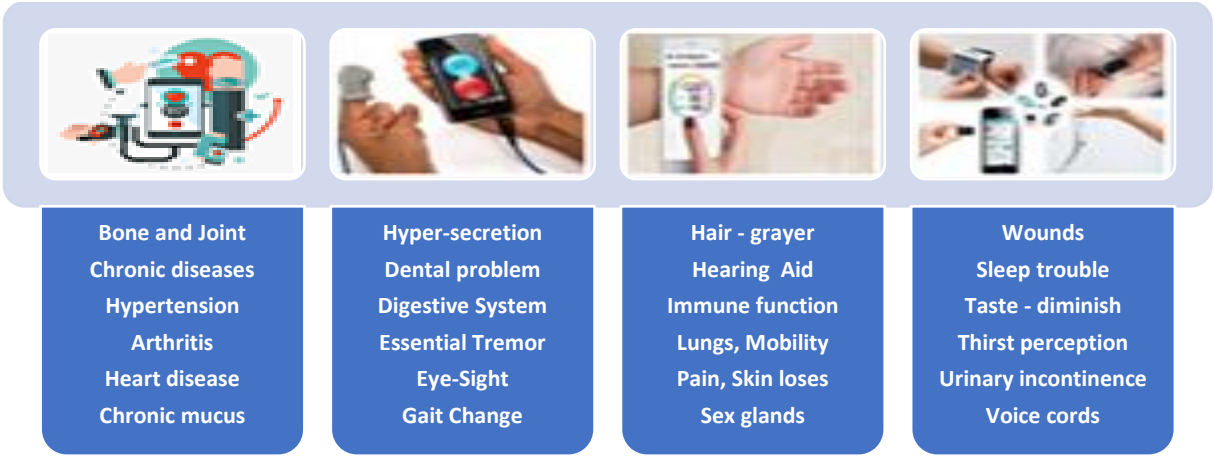

Figure 2. Senior people's common health problems

1.1 Related Work

The Real-time fitness care affected old aged person monitoring gadget appeal to one-of-a-kind interest from the researchers in the scientific discipline [1]. The patient's day-by -

day endeavour of monitoringtheir body condition ispresented by R.A.Karthika et. al. [2]. J. Kharel, et. al., discussed, structured clever fitness monitoring gadget primarily based on fog computing [3]. D. Puthal, et. al., visualises, fog computing challenges and future directions [4]. SirishaPotluri, deals, optimization management for QoS based assignment scheduling in cloud computing technological areas [5]. M. Aazam, et. al., discusses, fog computing architecture, and future research directions for elders [6]. Atta-ur-Rahman, deals, seven well-known interface for health-care functions [8]. For this work, all sorts of ECG indicators were composed with pain assessment method of PQRST intervals. The clinical cardiac rhythm monitored by the edge devices can be transmitted through 3G/4G of Wi-Fi connectivity to the fog computing. The ECG signals are noise filtered, these sensors arefed to the Raspberry Pi 3. The Raspberry Pi, after processing, concludes that the person is sick or not.

2 The IoT

The "Savvy" IoT, can be used for urban communities, water, agribusiness, structures, meters, vehicles, machines, labels, animal cultivating, farming and so forth.The facility of health-care embody rate reduction, improved treatment, faster disorder diagnosis, pro-active treatment, drugs and equipment administration etc. The IoTprocess functions are demonstrated in Figure 3.

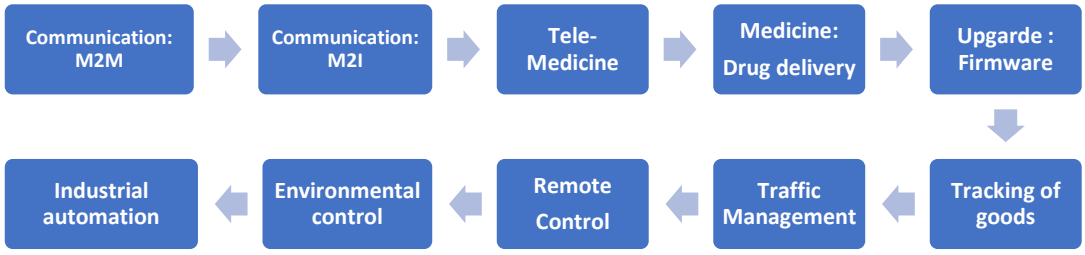

Figure 3.IoT Communication for various applications

2.1 Stages of IoT Solutions

The IoT serves billions of low-cost, lengthy range, ultra-energy environment friendly devices and machines, which wants connectivity from far off locations. This can also be wired or wireless communication. While LPWA cell applied sciences had been brought with Narrow Band IoT (NB-IoT) and LTE-M in 3GPP. The complete structure of IOT is proven in Figure 4a and 4b.

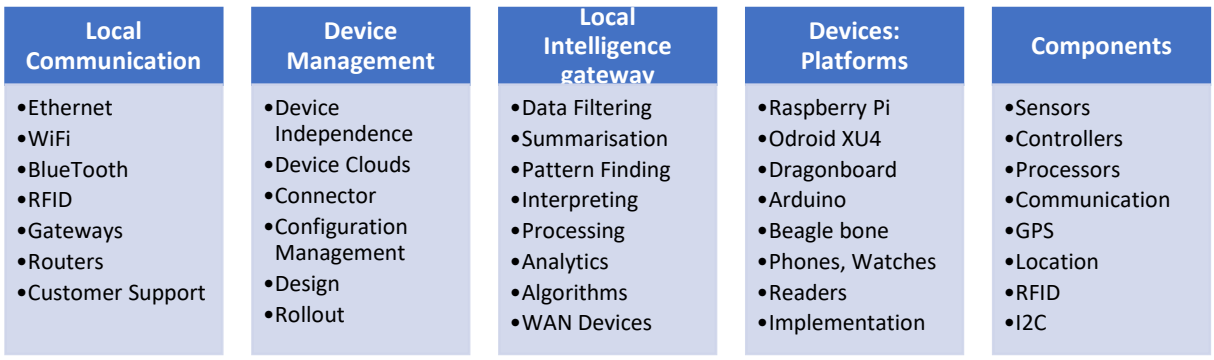

Figure 4a: The stages of IoT Solutions

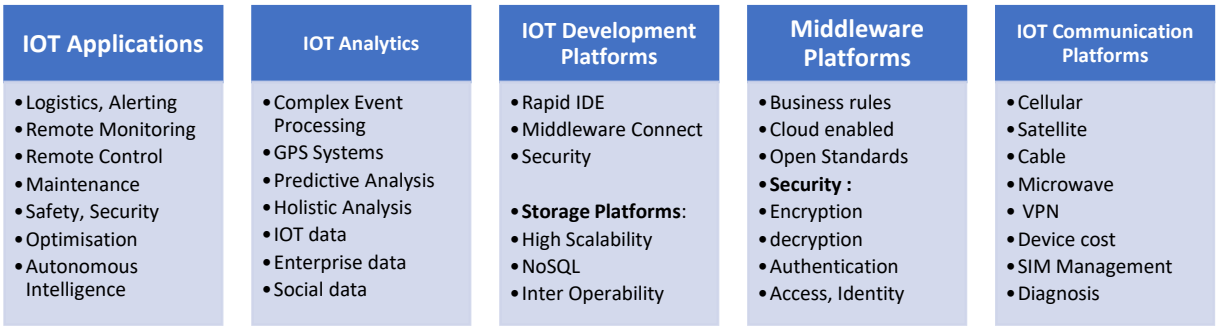

Figure 4b: The stages of IoT Solutions

2.1.1 Ubiquitous Computing

This thought makes use of small device, which is related through internet, is enabled to do required function. For example, a home Ubiquitous Computing surroundings may be of interconnect lights, so that, illumination and heating stipulations in a room would possibly be modulated, and imperceptibly. The Ubiquitous offerings had been proven in Figure 5.

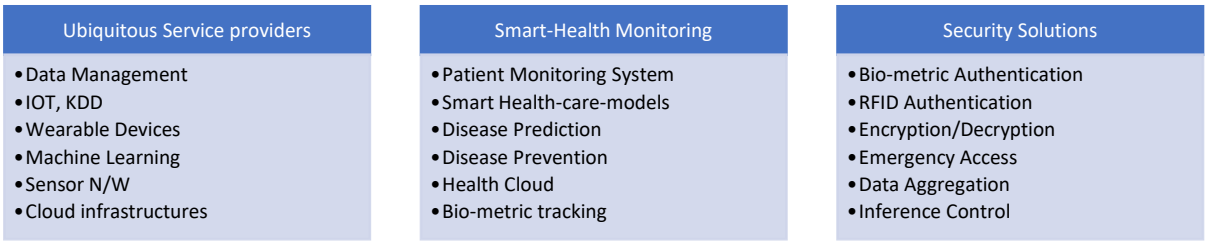

Figure 5. Ubiquitous Services

2.1.2 Cloud Computing

The Cloud computing can present massive capability of hardware and software program through the provider of service carriers and can be idea of as an amorphous cloud, which is visualised in Figure 6. M. Chen and V. Leung, discusses, cloud-based communications to the health-careflow is shown in a simple form usinggadgets [14].

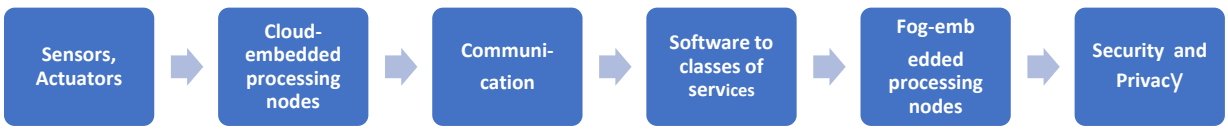

Figure 6. Capability of Cloud Computing

2.1.3 Fog enabled Computing

The Fog enabled computing can get admission to data objectively, and can shop confined statistics with accuracy. C. A. Silva et. al., discusses, fog computing in health-care surroundings for aged peoples [9]. Farahani.B, et. al., deals, fog-enabled IoTapplied e-health-care for the elders [10]. D. Kimovski, et. al., deals, adaptive nature of stimulated fog structure to reveal the sufferers [15]. The Characteristics of Fog Computing is proven in Figure 7.

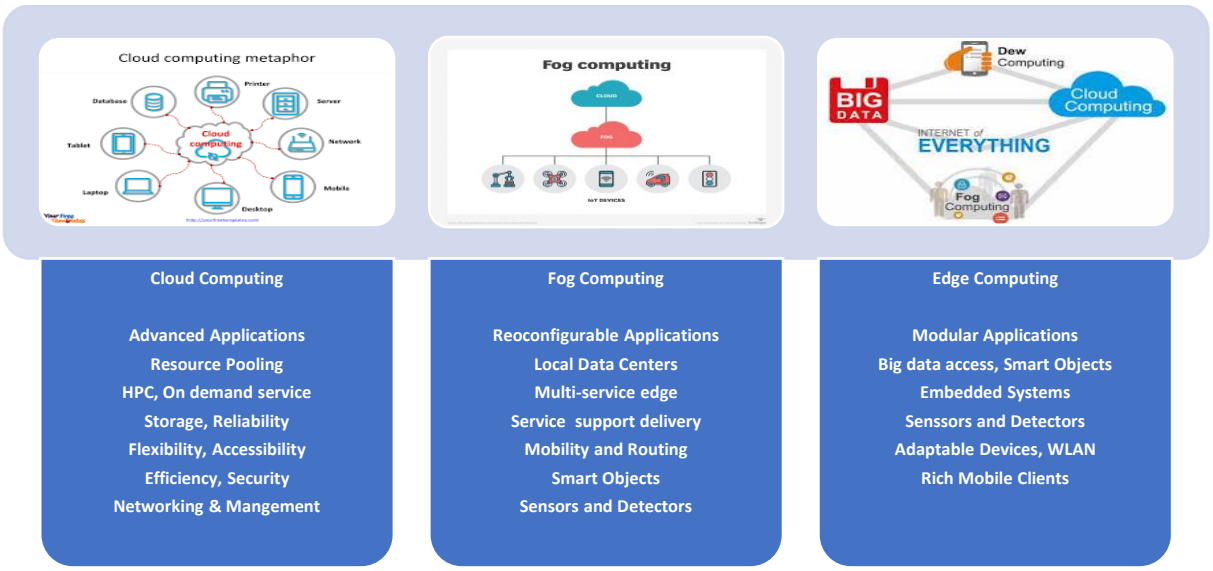

Figure 7. Characteristics of Fog Computing

2.1.4 Edge Devices

The purpose of Edge Computing is to pass the computation away from records centres toward the part of the network, exploiting clever objects, cellular telephones to function duties and supply services on behalf of the cloud as mentioned via Zhao, Xianlong, et. al. [7]. H. F. Atlam, et. al., discusses, IoT, its benefits, challenges, and future instructions [11]. This suggests ubiquitous computing units that envisaged a robust guide to this concept which consist of Smart Phones, Laptops, Tablet PC, Smart Watch and interactive white-boards, etc., connected by RF tags, GPS. Figure 8, shows, monitoring the elder patient's withAPMS, using edge devices.

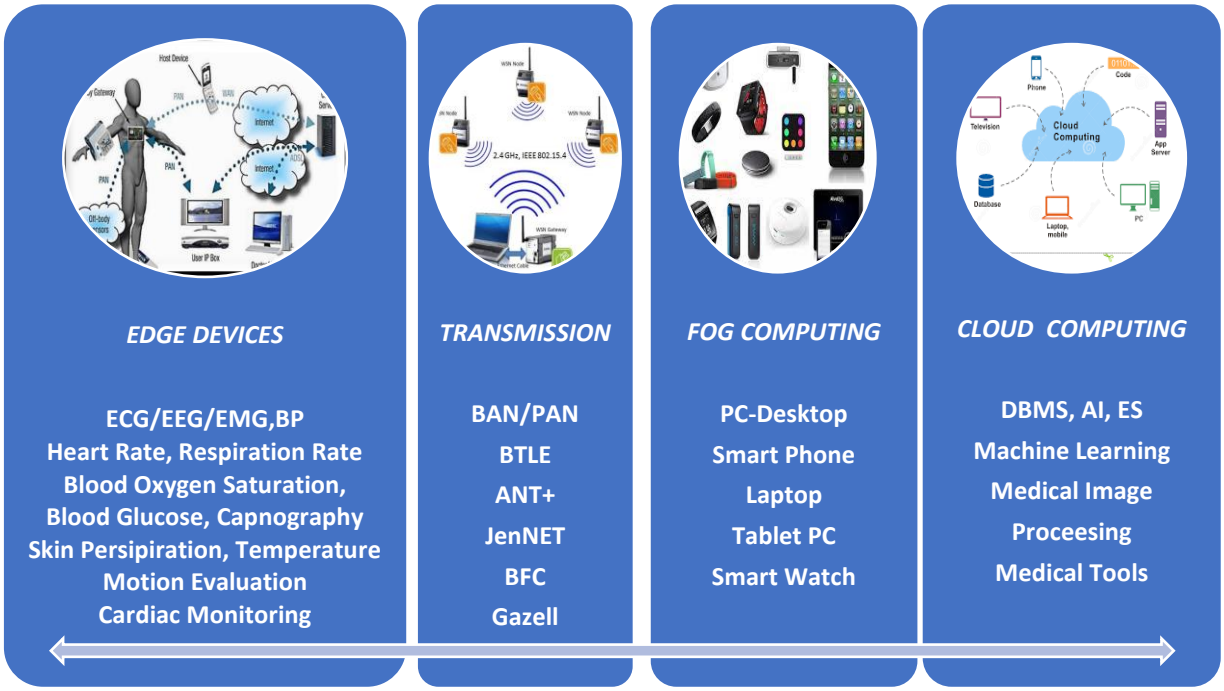

Figure8.APMSEdge Devices

2.1.5 Arduino and Raspberry Pi

An easy instance of an actuator is an electric powered motor that converts electrical electricity energy into mechanical energy. M. Wang, et. al., deals, Machine gaining knowledge of records stored in databases for health-care [12]. A. Abeshu, et. al., discusses, deep gaining of knowledge for dis-order detection in fog computing surroundings [13]. Actuators might also be an output gadget which produces sensor. The accelerometer and gyroscope fetches signals, these indicators noise is filtered, this will be despatched to Analog and Digital Controller (ADC), then shipped to Digital Signal and Processing (DSP), and subsequently goes to the Raspberry Pi to take desirable selection as proven in Figure 9.

Figure 9. APMS - Symptoms processing – simple steps

The proposed graph methodology, which is introduced consists of many stages. In order to keep all the essential elements of the plan system, the potentialities of the respective users, the graph of the device is taken care at each and every stage. Figure 10, offers the glide of affected person's m-health using the flow of APMS.

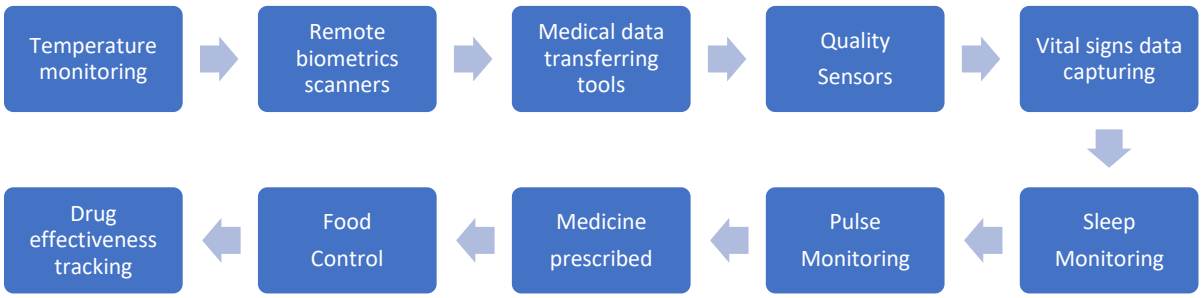

Figure 10. Flow of APMS

An Arduino is a microcontroller, which is now not having any OS. A Raspberry Pi is like a laptop, on its very own and it has OS, for instance Linux. An Arduino can run, one application at a time. The Raspberry Pi, has a good deal greater reminiscence space, can run numerous packages in parallel way at a time, whereas an Arduino commonly desires an extra thing to join internet. A Raspberry Pi, additionally carries the crucial hardware for convenient connection to the internet. The Raspberry Pi,as a whole, it has lot of successful capabilities than an Arduino. It is pretty common, to use a mixture of a Raspberry Pi and an Arduino as a hybrid system. The Raspberry Pi acts as master system and the Arduino acts as slave to the Raspberry Pi. The Raspberry Pi offers instructions to the Arduino and controls it totally.

3 Implementation and Result

The Details of hardware necessities are a) Raspberry Pi-3 board b) Speaker c) Sensors d) A to D Convertor e) Power Supply Unit f) Regulator Unit g) PC h) Tablet PC i) Arduino and j) Smart Phone. The block layout of Raspberry Pi, is proven in Figure 11. The Arduino, drift of work is proven in the Figure 12. The Mouse and Keyboard identified with the USB port of Raspberry Pi and the screen connected to the HDMI video port. The sensors

connected to the GPIO pin through which the measurements from the Raspberry Pi is moved to the worker and the related individual can picture the data on the screen.The package implementation Raspberry Pi for APMS is proven in the Figure 13.

Taking the beat rate, blood pressure and coronary pulse beat, the advanced yield from the sensor through the Raspberry Pi is shown on the Monitor. The Figure 14, demonstrates the demonstration of the m-wellbeing wellness observing machine of APMS, shows as ECG signal. The Raspberry Pi advanced camera yield is shown on the worker, the IP address tackle of the worker is indistinguishable as that of IP address tackle of the Raspberry Pi. The Sensors yield is shown on the worker, is demonstrated in Figure 14. This is put away in a data base, for future prerequisite.

In case theAPMS, BP>120, an urgent alert signal/message/e-mail/alarmwill be conveyed to the APMS through the medical doctor, who gives ideal prescription alongside with dosage of medicine. If the affected person, is in atypical condition, it will be despatched to the caretaker of the APMS.The trouble of controlling the aged APMS fitness is very complex.

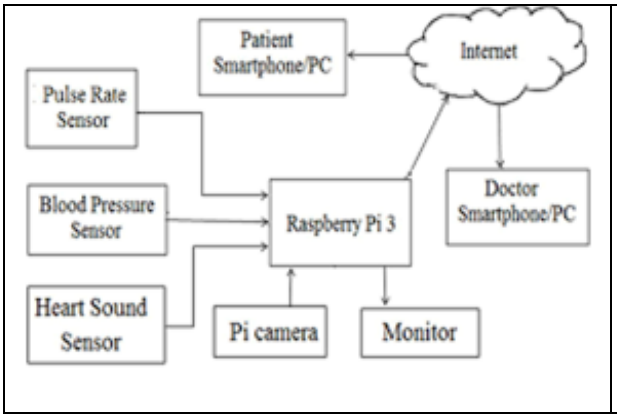

Figure 11. Raspberry Pi – block diagram

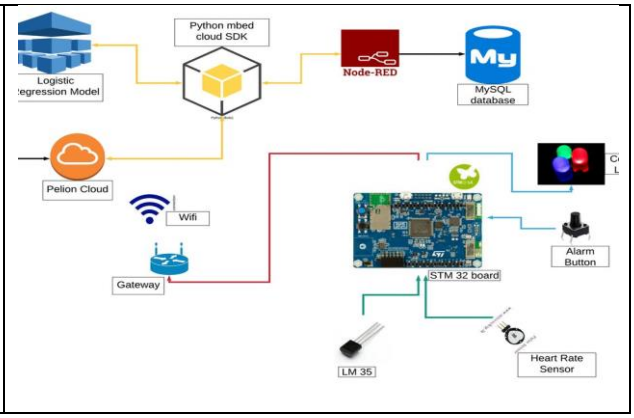

Figure 12. Arduino – kit - flow

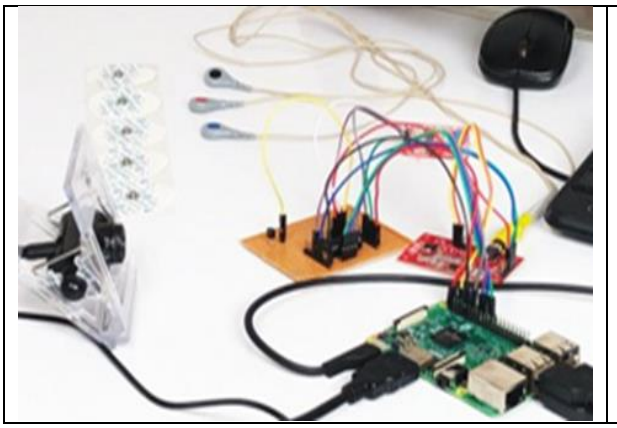

Figure 13. Raspberry Pi – kit

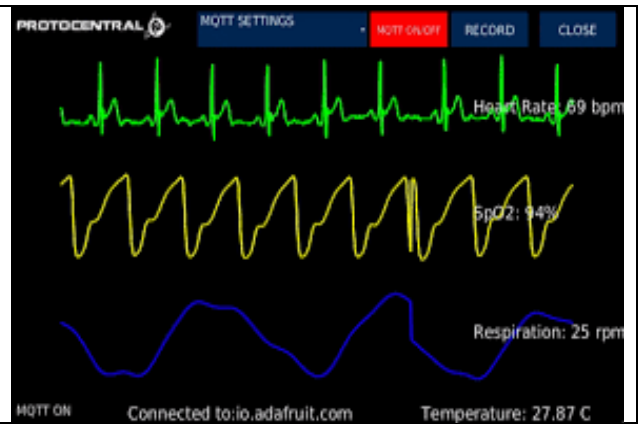

Figure 14. ECG –Signal

4 Conclusion

In this paper, the improvement of a cheap monitoring gadget for aged people with embedded fall of diseasefinding module has been discussed. The motivation of the proposed edge devices is to make sure of aged person's health, who stays at home during 24 X 7, hours. Theyounger peoples are away from domestic for working. Our developed machine is outfitted with a low fee hybrid boardcombined with Raspberry Pi and Arduino. This is embedded with easy internet digital camera, to allow 24 X 7 hours of domestic APMS. The digital camera will record all the movements of elder peoples correctly. This notification will be despatched to the household contributors to give an alert message to avoid any untoward incident such as minor accidents, drowsiness or any sort of sickness. Furthermore, the storeddata in the cloud can be used in any match of forensic procedure in the future.

5 Future work

This proposed service provider of APMS structure, possesses the indispensable factors of every future scientific utility that are built-in with current scientific practices and applied sciences in real-time, faraway monitoring, in giving medication, and affected person reputation fully automated machine assisted by using embedded in wi-fi sensor network.

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