IOT BASED HEALTHCARE SYSTEM

Neha R. Jethawa[1], Pooja B. Gajghane[2], Prof. Jayesh K. Kokate[3]

[1,2]UG Student, Electronics & Telecommunication Engineering, Siddhivinayak Technical Campus, SERT, Shegaon, India.

[3]Assistant Professor, Siddhivinayak Technical Campus, SERT, Shegaon, India.

Abstract : This paper presents the IOT based health monitoring system which can be provides emergency medical services. These are possible using the INTEL GALILEO 2ND generation development board and e-health sensor. The idea of this concept comes to reduces the headache of patients to visit the doctor every time. With the help of this proposal the time of both patients and doctors is save.

IOT can be define the wireless network of devices which are connecting to each other to share the information and data, in order to communicate and provide new information, to record and analyze it for future use. It is observed that using IOT, the health monitoring system is more reliable system. This system will provide the feature to improve health related problems and reduces healthcare cost. It also saves the time of patient and doctor. This paper can be viewed as IOT innovations that can be lead to various healthcare solutions.

Index Terms **- IOT, Health care, Health monitoring, Medical services, GALILEO Board, e-health sensor.**

1 INTRODUCTION

The IOT can be defined as capturing and sharing of vital data of the network connected devices through secure layer. The IOT can also be defined the wireless network of devices which can connect to each other to share information and data in order to communicate and produce new information, to record and analyze it for future use.

In Order to make our health care services roust and vast, the IOT relies on several enabling technologies. These not only make word connected but also robust and comfortable.The IOT in the field of healthcare also plays a major role in providing easy communication between the patients and doctors. It consists of a system that communicate between network connected systems, apps, and devices that can help patients and doctors to monitor, track and record patients. Most of significant changes are occurring in the field of IOT healthcare. The way of interacting and communicating with human and other devices is changing and getting better day by day. Management of healthcare results and reduction of healthcare cost is enabled by the ever growing information and communication solutions.

The advantage of IOT healthcare, consumers, patients and other health experts need to think of some innovative and more reliable methods.Moreover, in today's world everyone is busy so they are neglecting their small healthcare problems. The paper helps to find a better and robust solution to this challenge.
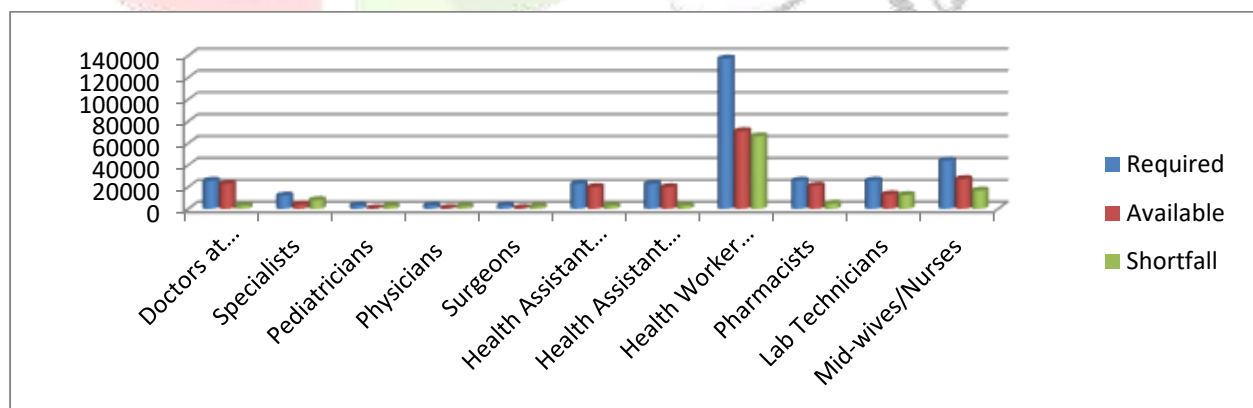

Figure 1.1: statistic of actual scenario of required, available and shortfall of the doctors in india

The above fig.1.1 statistics represents the actual scenario of required, available and shortfall of the doctors in India. Blue lines indicate required of doctors, red line indicates available of doctors and green line indicate shortfall of doctors. In this way we conclude that there is a huge gap between required and available doctors.
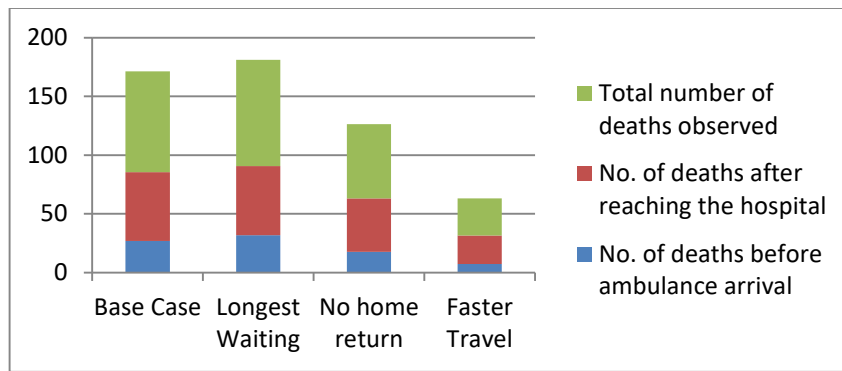
Figure 1.2 scenario of death due to delay in transport medium

The above fig.1.2 statistics represent the scenario of death due to before ambulance arrival and death due to after reaching hospital, so from this statistics we can say that transport medium also plays important role in saving the patients.

2 LITERATURE SURVEY

This paper "IoT based Smart HealthCare Kit" presented by Punit Gupta, Deepika Agrawal, Jasmeet Chhabra, Pulkit Kumar Dhir. The paper presents the design and implementation of an IOT-based health monitoring system for emergency medical services which can demonstrate collection, integration, and interoperation of IoT data flexibly which canprovide support to emergency medical services like Intensive Care Units (ICU), using an INTEL GALILEO 2ND generation development board [1].

This paper "IoT based Smart Health Care Kit: A Review" presented by Miss. P. P. Deshmukh, Prof. P. R. Indurkar, Prof. D. M. Khatri. The paper presents a review of IoT-based health monitoring systems has been presented. It is observed that using IoT the health monitoring system is controlled, which indicates a reliable system. This system will enable users to improve health related issues and reduce healthcare costs [2].

This Paper "A Functional Approach for Wearable Health Solution with Intel Galileo Gen2" presented by NicyKaur Taneja, Dr. S.R.N. Reddy.The paper presents the scenario, the elderly age group is considered to be at Shigh risk in terms of health and socioeconomicstatus. Most of the elders are suffering from either one of the health problems. Many solutions are present in the market but most of them focus on measuring either only heart beat or ECGmonitoring. The remote monitoring of such patients is carried out by saving their personal and health data on the webserver installed at the healthcare centre.This solution adds an additional investment in large-scale storage and processing capacity. Therefore, an enhanced health monitoring system is required that measures some health data as well as physical parameters of the patient [3].

3 CONCEPT

This system is robust health monitoring system that is intelligent enough to monitor the patient automatically using IOT that collect the status information through this system which would include patient's heart rate, blood pressure and ECG and send an emergency alert to patient's doctor with his current status and full medical information. This would help the doctor's to monitor his patient from anywhere and also to the patient to send his health status directly without visiting to the hospital. The system uses smart sensors that generate raw data information collected from each sensor and send it to a database server where data can be further analyzed and statistically maintained to be used by the medical experts. Maintaining a database server is a must so that there is even track of previous medical record of the patient providing a better and improved treatment.
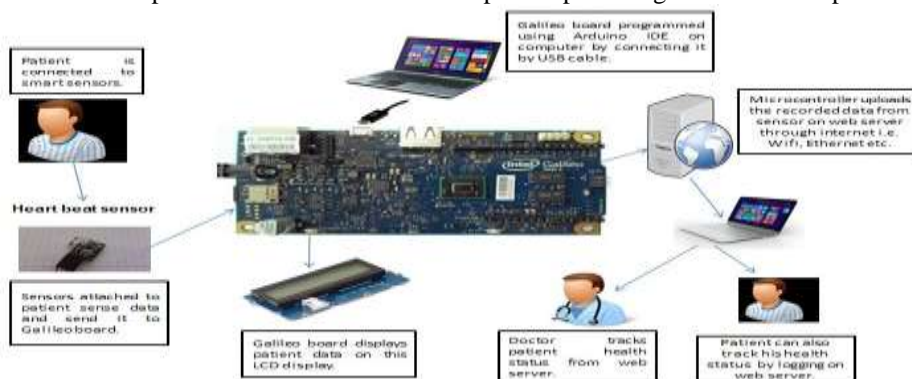

Figure 3: system architecture

4 HARDWARE

The brain of our model is theINTEL GALILEO 2ND board, a single board which is based on the Intel Quark SoCX1000, a 32-bit Intel Pentium processor- class system on a chip (SoC). It is Arduino-certificated and designed to be hardware and software. Intel Galileo 2nd board is preferred over Arduino because this provides a Linux platform with high processing and computing power within build Ethernet shield and SD card support. It gets the information's. These brains collect the data from all the sensors connected to the patient and upload this data on the web server via Ethernet. The doctor can keep track of the entire patient's data through the web client.

4.1 Introduction of Galileo Gen 2

Intel® Galileo is a development board based on Intel x86 architecture. It was designed mostly for the maker and complies with open source software and hardware licenses. If you are familiar with the Arduino boards, you will find this board somewhat similar; the reason being this board was designed to be hardware and software compatible with the Arduino. It combines Intel technology with support for Arduino shield and libraries.

Intel's Galileo Gen 2 Board is the first in a family of Arduino-certified development boards based on Intel® architecture and specifically designed for makers, students, educators, and DIY electronics enthusiasts. Based on the Intel Quark™ SoC X1000, a 32-bit Intel Pentium® processor-class system on a chip (SoC) and the genuine Intel processor and native I/O capabilities of the Intel Galileo provides a full feature offering for a wide range of applications. Additionally it allows user to incorporate Linux firmware calls in their Arduino sketch programming.

Galileo support shields that operate at both 3.3V and 5V. The generally operating voltage of Galileo is 3.3V. However, jumpers on the board enable voltage translation to 5V at the I/O pins. This provides support for 5V Uno shield and is the default behaviour.

Figure 4.1: galileo gen 2

The Galileo board is a software compatible with the Arduino Software Development Environment (IDE), which makes usability and introduction a snap. It is also Arduino hardware and software compatibility, the Galileo board has several PC industry standard I/O ports and features to expand native usage and capabilities beyond the Arduino shield ecosystem. A full sized mini-PCI Express slot, 100MByte Ethernet port, Micro-SD slot, RS-232 serial port, USB Host port, USB Client port, and 8MByte NOR flash come standard on the board.
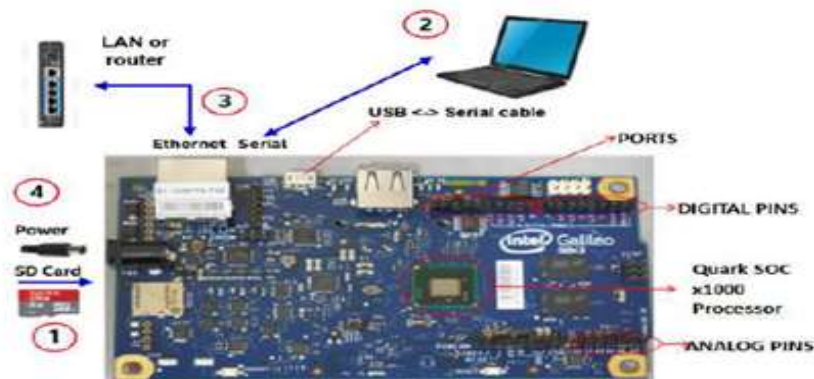

Figure 4.2:intel galileo gen2 development board

4.1.1 Features of Galileo

- 400 MHz 32 bit Intel Pentium instruction set architecture
  - 512 KB of on-die embedded SRAM
  - Simple to program: Single thread, single core and constant speed
- 10/100 Ethernet connectors
- Full PCI Express mini-card slot, with PCIe 2.0 compliant feature

- USB 2.0 Host connector
- USB Device connector, used for programming
- 10-pin Standard JTAG header for debugging
- Reboot the button are available to reboot the processor
- Reset button to reset the sketch and any attached shield
- Storage options:
  - Default - 8 MB Legacy SPI Flash main purposes is to store the firmware and the latest sketch.
  - Between 256KB and 512KB is dedicated for sketch storage.
  - Default 512 KB embedded SRAM.
  - Optional micro SD card offers up to 32GB of storage
  - USB storage works with any USB 2.0 compatible drives
  - 11 KB EEPROM can be programmed via the EEPROM library.

4.2 The e-Health shield V2.0

The e-Health sensor shield V2.0 allows Galileo board to perform biometric and medical applications where body monitoring is needed by using 10 different sensors: pulse, oxygen in blood, airflow (breathing), body temperature, ECG, glucometer, galvanic skin response, blood pressure, patient position and EMG.

This information can be used to monitor in real time state of a patient or to get sensitive data in order to be subsequently analysed for medical diagnosis. Biometric information gathered can be wirelessly sent using any of the 6 connectivity options available: Wi-Fi, 3G GPRS, Bluetooth, 802.15.4 and ZigBee depending on the application. The Galileo and e-health shield V2.0 are connected to each other through analog and digital I/O pins.

Data can be sent to the Cloud in order to perform permanent storage or visualized in real time by sending data directly to a laptop orSmartphone. IPhone and Android applications have been designed in order to easily see the patient's information's.
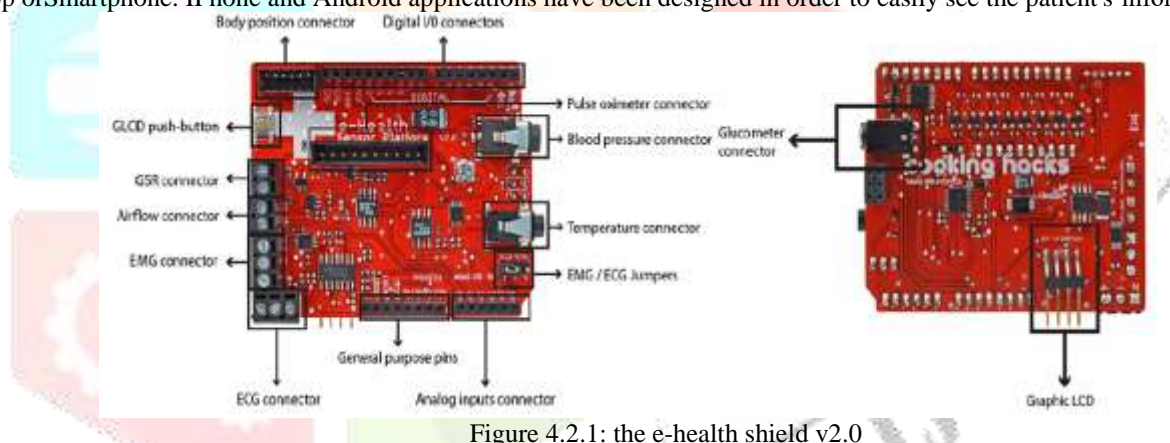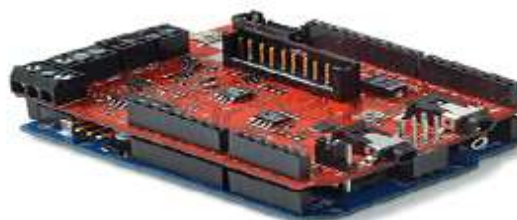

Figure 4.2.1: the e-health shield v2.0

Figure 4.2.2: e-health shield v2.0plased on galileo gen 2

Figure 4.2.3: various type of sensor

5 SOFTWARE

The software part includes an Arduino IDE which is needed to program our INTEL GALILEO 2ND Board which was used to upload our final code of maintaining a database. All the data connected to the sensors is sent to aXampp based data base server to log the patient timely record or sensed data, which will help the doctor for better consulting and prescription to patient. The server has an option for uploading thedatabase of the patients with their details and their medical history. The data server can be accessed any time by the doctor and the doctor can also see the current live feed of the patient's medical condition. A track of patient's health record is also maintained for future reference on the web portal. The portal also has the option to maintain and track the 24-Hour records of multiple patients. The patient can also see his/her medical details on the web portal. Thus this system proves to be an efficient and robust way to maintain and analyze one's medical record and live track.

Health Monitoring System Care of critically ill patient requires spontaneous & accurate decisions so that life-protecting &lifesaving therapy can be properly applied. This paper is based on monitoring of patient. We have designed and developed a reliable, energy efficient patient monitoring systems. This is able to send parameters of patient in real time. It enables the doctors to monitor patient's health parametersin real time. Here the parameters of patient are measure continuously and wirelessly transmitted. This concept provides a solution for enhancing the reliability and flexibility by improving the performance and power management of the patient monitoring system. If a particular patient's health parameter falls below the threshold value then an automated SMS is sent to the pre-configured Doctor's mobile number. Here, we are using wireless transmission. The Doctor can get a record of a particular patient's information's by just accessing the database of the patient on his PC.

Overall work based on developing IOT based health care system on Galileo Gen 2 based e-health shield V2.0 equipped with various sensors which is connected directly to internet through on board Wi-Fi and analysis can be done.

6 WORKING

The device is designed to be wearable by the patient who will help to monitor him continuously. The respiratory module will measure the breath of the patient, temperature sensor will monitor the body temperature, heart beat sensor will monitor the heartbeat rate by placing the finger for about one minute and accelerometer will tell about the position of the patient, etc.The numbers of sensor are connected to the Galileo Gen 2 through e-health Shield sensor V2.0. The data will be displayed on LCD and can also be monitored on an android device or PC using wireless or wired network communication.
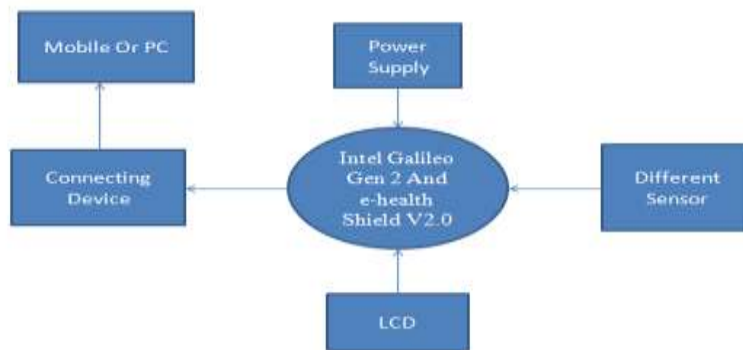

Figure 6: block diagram of iot based smart healthcare kit

We have proposed a robust health monitoring system that is intelligent enough to monitor the patient automatically using IOT that collects the status information through these systems and sends an emergency alert to patient's doctor with his current status and full medical information's. This would help the doctor to monitor his patient from anywhere and also to the patient to send his health status directly without visiting to the hospital. The system uses smart sensors that generates raw data information collected from each sensor and send it to a database server where the data can be further analyzed and statistically maintained to be used by the medical expert. Maintaining a database server is a must so that there is even track of previous medical record of the patient providing better and improved examining.

The doctors, attender of the patient and the patients can view the details using the mobile application or through the web. The mobile applications are accessed by doctors through their user name and password. The doctor can view all the detail associated with their patient. If the doctor wants to access any of his patient's data he can request to send the current status of the patients and retrieve the data from the IoT device to their mobile device after updating with the server. If patients or caregivers of patients' want to access the details of the patient they have to use the patient identification number to login and view the detail.

7 ADVANTAGES

- Reduced Cost: By leveraging connected healthcare solutions, patient can be monitored on a real-time basis, thereby cutting down unnecessary physician visits. Advanced homecare facilities will cut down hospital readmission and stay.
- Improved Treatment Outcome: Connected Health enable caregivers to get access to real-time information resulting in data-driven, informed decisions and evidence-based treatments can help provide timely care and boost treatment outcome.
- Real-time Disease Management: With continuous monitoring of patient and access to real-time data, diseases can be treated as proactively before their condition worsens.
- Minimizes Error: Automated workflows, accurate data collection and data-driven decisions cut down wastes, minimize error and reduce system cost.
- Improved Patient Experience: Connected Health genuinely focused on a patient centricity. Better accuracy in diagnosis, proactive treatments, timely physician intervention and improvement in treatment outcomes lead to accountable care resulting in high trust among patients.

8 LIMITATION

In the traditional approach the healthcare professional play the major role. They need to visits the patient's ward for necessary diagnosis and advising. There are two basic problem associated with this approach. Firstly, the healthcare professionals must be present on site of the patient all the time and secondly, the patient remains admitted in a hospital, bedside biomedical instruments, for a period of time.

1. In order to solve these two problems, the patients are given knowledge and information about disease diagnosis and prevention.

2. Secondly, a reliable and readily available patient monitoring system (PMS) is required.

9 FUTURE WORK

The Future work of the concept is very essential in order to make the design system more advanced. In the designed systems the enhancement would be connecting more sensors to internet which measures various other health parameters and would be beneficial for patient monitoring i.e. connecting the entire object to internet for quick and easy access. Establishing a Wi-Fi mesh type networks to increase in the communication range.

10 CONCLUSION

With the wide use of internet this work is focused to implement the internet technology to establish systems which would communicate through internet for better health. IOT is expected to rule the world in various fields but more benefit would be in the field of healthcare.

At present, no portable healthcare system is available. The main disadvantage to design health monitoring system is large size. For designing of Health care monitoring system using Intel Galileo and database stored on local server gives higher delay with larger hardware required. So, as to reduce the delay and to minimize the power consumption we can use Galileo Gen 2 with database stored on internet. Hence, designing of IOT based health monitoring system using Galileo Gen 2 with high speed and less area will be the probable outcome of this proposed work.

REFERENCES

[1] Punit Gupta, DeepikaAgrawal, Jasmeet Chhabra, Pulkit Kumar Dhir, "IoT based Smart HealthCare Kit", 2016 ICCTICT.
[2]Miss. P. P. Deshmukh, Prof. P. R. Indurkar, Prof. D. M. Khatri, "IoT based Smart Health Care Kit: A Review" 2017 IJSRD.
[3]Nicy Kaur Taneja, Dr. S.R.N. Reddy, "A Functional Approach for Wearable Health Solution with Intel Galileo Gen2", 2016 NCPD.

[4] T. M. V. KUTUMBA RAO, SK. IMAM, GAJJALA ASHOK, "Implementation of Smart Health Care System with IOT Technology", 2016 IJSETR.

[5] S. M. Riazul Islam, DaehanKwak, M. D. HumaunKabir, Mahmud Hossain, "The Internet of Things for Health Care: A Comprehensive Survey", 2015 IEEE Access (Volume: 3).

[6] John Glaser, Devices everywhere talking to devices anywhere could radically change health care. June 4, 2015.

[7] http://www.iimb.ac.in/sites/default/files/Emergency%20Healthcare %20v3%20May%202013.pdf

[8] https://www.healthvault.com/in/en/overview.

[9] http://www.mouser.in/new/intel/intel-galileo-gen-2.