Health Monitoring System

Hemalatha K N[1], Suraj B G[2]
[1] **Professor,** Dept of Computer Science and Engineering
[2]Dept of Computer Science and Engineering
[1, 2] Atria Institute of Technology, Bangalore Karnataka, India

Abstract- *In the recent years of health care development, we witness huge amounts of data flow to track few parameters of a person and alert the guardian in case of any emergency of the patient. This establishes a need for a single platform where users can monitor the data on a real time basis. This paper talks about health monitoring systems which allow patients to be monitored without having a need to visit the doctor which can be implemented with market sensors. The module gives the necessary opportunity for all day service for the patients which can be recorded by the doctor and can receive a notification in any case of emergency. This platform forms a great use when a patient is under frequent checkup or under home care for a long period of time.*

Keywords- Health monitoring system, sensors, Health sensor platform, Internet of Things.

I. INTRODUCTION

The growing network of devices connected to IOT are increasing every day. Most of these technologies are being used in developing healthcare effectively. Before, introduction of mobile applications healthcare was becoming a lot expensive and less affordable. With all the modern devices in the industry to monitor the patient regularly makes it more affordable and less expensive making the healthcare system more feasible. In this paper we present various situations in which the Health monitoring system finds useful for the physician and the patients.

- Health monitoring system acts useful when during road accidents, where the patient can be monitored all the way to hospital and which gives a complete report of the patient which saves time in critical conditions.
- Patients who have to be monitored for a long period of term which causes a nurse to be expensive, and can adopt a health monitoring system.
- The module helps patients who live in distant areas which lack a hospital facility.

The above mentioned scenarios need a feasible platform where patients data can be continuously monitored and is robust. This requires a need for a health monitoring system and which can be critical in situations.

II. MODEL OF HEALTH MONITORING SYSTEM

The health monitoring system is classified into Data collection, Data monitoring and notification for the user to communicate.

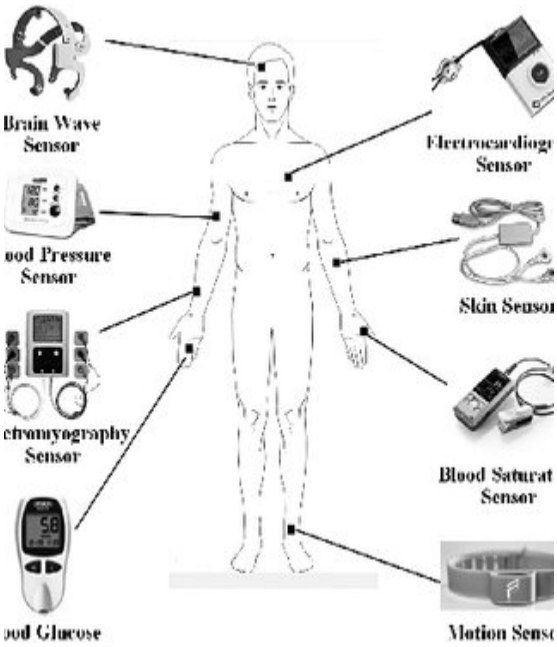

Figure 1. Collecting Data using Sensors

III. WORKING

A. Biometric Data collection

Data can be collected by various sensors attaching to the patient's body shown in figure 1. The data can be collected by a microcontroller platform and mapped into patients data records. This initially can also map multiple sensors to the patients database. Data collection of patients depends on the critical situation of the patient and this can be observed in a health monitoring system using a microcontroller. A wide variety of sensors are required in order to monitor the patient's body this can be replaced by an Sensor shield developed by medical developers for the purpose of the same. The primary sensors are:

- Accelerometer
- Glucometer sensor

- Oxygen in blood sensor
- Breathing (Sensor)
- Skin tractable sensor
- Blood pressure sensor
- ECG and EMG

All these sensors are connected to a platform which can be used when a necessary application is required depicts in figure 2. In this module we can make use of STM32 Microcontroller for high performance and all these sensors are Arduino boards which are used to communicate with the microcontroller. The STM32 microcontroller provides high performance and with a wide variety of LCD, Ethernet port, MicroSD, USB etc. With all the necessary features the microcontroller satisfies the need of processing power and high performance for data communication.

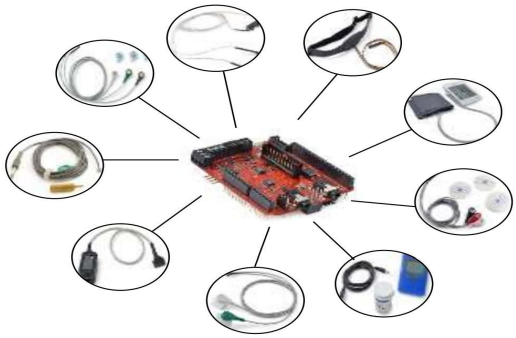

Figure 2. Sensor platform

With large demand for biomedical sensors, manufacturers are providing different protocols. The given Table 1 depicts senor protocols used to communicate with the microcontroller.

TABLE I. COMMUNICATION PROTOCOLS OF SENSORS

S.No	Sensor	Protocol
1	Patient Position Sensor	Digital IO
2	Glucometer Sensor	UART, Digital IO
3	Body temperature sensor	Analog In
4	Pulse & oxygen in blood sensor	Digital IO
5	Airflow sensor	Analog In
6	Galvanic Skin response sensor	Analog In
7	ECG sensor	Analog In
8	EMG sensor	Analog In
9	Sphygmomanometer	UART

B. Data processing

A patient's body parameters can be monitored regularly and can be used to keep track of patients history with few algorithms proposed by researchers [9][10] to treat the distant patients in an effective way. This paper concentrates on a single platform solution which helps the healthcare industry in all boundaries.

A patient who needs to be monitored when met with an accident takes help of the module which continuously updates the situation onto the cloud. This helps the doctor to be ready with required operation. The monitoring system helps to record the patient's data and his/her past incidents which helps to keep track of the health. If the patient's encounter with a periodic checkup this system helps to track the past of the patient which is recorded.

Patients under treatment for a long period of time of treatment must have regular checkups by doctor. This can be a hectic task for a doctor to visit on a regular basis with a patient in a remote location. With a health monitoring system this can reduce the traveling part and it can send an emergency signal to the doctor in case of any fluctuations. The patient's body parameters like blood pressure, glucose level can be stored onto a cloud and if it crosses the threshold set and warning message can be sent to the concerned. This also helps patients under home quarantine for a long time.[3][9][10]

C. User Interface

The purpose of the user interface is to determine the parameters of the patient's body and notify the caretaker in an emergency case to be handled. This often consists of a mobile application or PC mainly shown in figure 3.

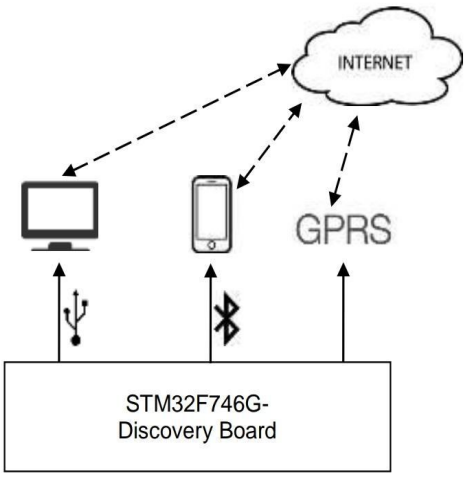

Figure 3. Data Communication

An LCD display is present in the discovery board which shows the log of patients' records stored in the

microcontroller. The display consists of a touchscreen display which allows us to navigate through the patient's record shown in figure 4. The display presents the body temperatures and patients ID with other parameters.

Figure 4. Onboard Display

The module can be used even with a smartphone application where the temperatures, location and other contents will be displayed. The microcontroller in turn is connected to a phone application with GPRS. The microcontroller regularly pushes patients data log to the cloud by which the application displays the whole. A threshold is set to the record where a notification beep can be sent if the blood pressure or other parameters exceeds the level which informs the doctor with an emergency. When the smartphone is active on the internet it connects and uploads the data to the server. A periodic synchronization takes place regularly. This is a bluetooth connected device and can Run on background while it keeps monitoring the data. The figure 5 shows the parameters which can be displayed on the app.

Figure 4. Smartphone Application

An native Visual Studio development can be used so that it runs on windows as well. The date is pushed onto the cloud and it can be fetched by the pc application and stored in a local database which is used to display on the app. The application also consists of updating or deleting a patient's history for doctors convenience shown in figure 5.

Figure 5. Windows Application

IV. ADVANCEMENTS

The healthcare market is one of the major in which there is a huge growth. Everyone can afford a health monitoring system or a wearable band which keeps them in regular update with body fitness. The bands cover blood pressure, body temperature, heartbeat and more advancements which is leading a major growth in healthcare. The future of the healthcare industry is more reliable on health monitoring systems for consumer safety and reliability.

V. CONCLUSIONS

As discussed in the paper with a standard microcontroller used and with right peripherals we can make a health monitoring system affordable to people. A band which can be used by patients, fire fighters, and others which can be monitored by the physician and gets a warning notification in case of an emergency and can be immediately considered to resolve. This has great biomedical sensors which help capture data and push onto the cloud so that the emergency message can be sent in case the threshold value is crossed. The microcontroller sends the value to the caretaker, and is synchronized frequently which helps the doctor react accordingly, the past records of the patient pushed on to the cloud helps the doctor get an clear view and monitor the patient.

REFERENCES

[1] S. S. Al-Majeed, I. S. Al-Mejibli and J. Karam, "Home telehealth by Internet of Things (IoT)," 2015 IEEE 28th

Canadian Conference on Electrical and Computer Engineering (CCECE), Halifax, NS, 2015, pp. 609-613.

[2] W.-J. Yi, O. Sarkar, S. Mathavan and J. Saniie, "Design flow of wearable heart monitoring and fall detection system using wireless intelligent personal communication node," IEEE International Conference on Electro/Information Technology (EIT), pp. 314-319, 2015.

[3] J. Cancela, M. Pastorino, M. T. Arredondo and O. Hurtado, "A telehealth system for Parkinson's disease remote monitoring. The PERFORM approach," 2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Osaka, 2013, pp. 7492-7495.

[4] M. Suganya and S. Jayanthy, "Telehealth system for home environment," 2016 International Conference on Emerging Technological Trends (ICETT), Kollam, 2016, pp. 1-6.

[5] STMicroelectronics, "Discovery Kit for STM32F7 Series with STM32F746NG MCU,"2016.[Online].Available: http://www.st.com/st-web-ui/static/active/en/resource/technical/document/user_manual/DM00190424.pdf.

[6] Cooking Hacks, "e-Health Sensor Platform," [Online].Available:https://www.cooking-hacks.com/ehealth-sensors-complete-kit-biometric-medical-arduino-raspberry-pi.

[7] Microsoft, "Visual Studio" [Online]. Available: http://visualgdb.com/tutorials/arm/stm32/

[8] W.-J. Yi and J. Saniie, "Design Flow of a Wearable System for the Body. Posture Assessment and Fall Detection with Android Smartphone," International Technology Management Conference (ITMC), pp. 1-4,2014.

[9] W.-J. Yi and J. Saniie, "Smart Mobile System for Body Sensor Network," IEEE International Conference on Electro/Information Technology, May 9-11,2013

[10] O. Gencoglu, H. Simila, H. Honko and M. Isomursu, "Collecting a citizen's digital footprint for health data mining," 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), pp. 7626-7629, 2015.