SMART HEALTH MONITORING SYSTEM

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Abstract—Health is one of the global issues of humanity. In addition to recording the health parameters through the sensing device, plays a major role in the medical system in order to convey, record and display the measured parameters. It is necessary to supervise various medical parameters and send the operational data to the server. Medical communication using IOT (Internet of Things) method is adapted to access medical parameters of patients in local as well as remote areas. Hence, this paper mainly focuses on collecting as well as sending various monitoring information or physiological parameters by using a temperature sensor, heart rate sensor, GSR monitor and ECG of the patients in hospitals or in their homes to a dispersed medical doctor or practitioner. The main purpose of this paper is to transmit patient health monitoring parameters through wireless communication. These input data will be uploaded to the server and sent to the computer or mobile for the referral of the doctor.

Keywords—Internet of Things (IOT), Telemetry System, Microcontroller, GSM Module.

I. INTRODUCTION

In recent years, the development of the Internet is noticeable, and it also connects the things through the Internet. All devices are interconnected via various smart technologies and create a worldwide connected network called Internet of Things (IoT). The enlargement of technologies such as IoT produces large amounts of data and leads to the innovative era of information. The data generated by the IoT device is used for analysis and decision-making purpose. IoT applications can be grouped into multiple domains as follows:

- Transportation and logistics
- Health care
- Smart environment
- Individuals and society

Internet of Things plays a vital role in above defined fields such as in Transportation and Logistics IoT is used for vehicle identification, inter-vehicle communication, traffic communication, etc. Presently, the government focuses on developing smart cities that use of all emerging technologies and can compete on the national level as well as international level technologies. As in today’s world, each and every person is surrounded by the smart devices in so many forms such as smart phones, smart home automation systems etc that are connected to 3G / 4G networks and social networks. The strength of IoT has great influence on our daily routine such as it makes human being capable to control the wastage of electricity by offering the concept of home automation system, monitoring the health of patients by using IoT based health monitoring system. IoT is widely used technology in the field of medical science. The IoT device is used to collect, monitor, evaluate and notify the about various parameters that can influence the health of patient. The application of IoT devices in medical and healthcare are:
Remote monitoring medical parameters
- Diagnosis
- Tracking medical equipment
- Security and access, indoor environment
- Smart hospital services
- Entertainment services.

Although various IoT based patient monitoring systems has been developed but still there is a barrier that exist while doctor monitors the patients. In order to analyze the patient's health status, various medical parameters are required, which reveals the patient’s health status. Hence it is again an issue to collect the data by using an appropriate network and then to share this data to the consultant doctors which shares the same networks.

Health is one of the global issues for mankind. According to the Constitution of the World Health Organization (WHO), the biggest achievable health standards are the fundamental rights of individuals. Healthy people lighten the burden on hospitals, clinics and healthcare workers, reducing the burden on public safety networks, charitable organizations, and government or non-governmental organizations.

In order to keep an individual healthy by utilizing modern health care system, it is necessary to have a state-of-the-art medical system that can be accessed effectively and easily. A modernized medical system must provide better medical services anytime, anywhere, in a more economical and a user friendly form.

Currently, medical systems are experiencing cultural changes from traditional approaches to modernized patient-centric approaches. In traditional approaches, health care workers play a major role. They need to visit the patient for the essential diagnosis and advices. There are two basic problems related in this approach.

Initially, medical staff must always be near to the patient all the time and secondly patients are connected to bedside biomedical equipment for a certain period of time while they are hospitalized. In order to solve these two problems, various patient-oriented techniques had been proposed. In this approach, patient information plays an important role in the diagnosis and prevention of diseases. An important element of this approach is a reliable and readily available patient monitoring system (PMS). The need for real time recording and notification of patient's vital signs is most important for effective PMS. By applying the recompenses of modern bio instrumentation, computers, and telecommunications technologies, modern PMS require to record, display, and transmit physiological data from patient's body at any time.

For more well-organized and timely, emergency medical care, the PMS must be incorporated into the anxiety system. In order to alert patients and medical service providers, PMS not only monitors and analyzes critical patient data, but also needs to send a warning message when the monitored data exceeds the normal range. Therefore, it is necessary to associate the active database system with the PMS. Mostly the planned PMS says that all patient data is stored on a distributed server so that it can connect to an open communication network via the TCP/IP protocol using the necessary firmware and software. Therefore, the patient can be monitored from a remote place. Recently, mobile networks are considered to be important for solving future global health problems.

Along with the infiltration of mobile phones into the universal market, the mobile health care system is become a mature idea. Through the mobile phone healthcare system, natives living in distant areas can use it without accessing other types of communication. Even simple cell phones have now become powerful medical tools. Text messages and telephones can quickly communicate or shares the information of patient on real-time basis and the critical information of a patient to isolated positions. Thus, a patient living in a distant location can reduce the back and forth movement to a remote medical center.
II. PROBLEM FORMULATION

A health system, also referred as the health care system, it is the association of people, institutions and hospitals that distribute health care services to meet the needs of the population. In order to maintain health care system, it is essential to have a state of the art medical system that can be accessed successfully and simply. Previously, when the patient came to the physician and if the physician is busy at that time with another patient, then the patient had to wait for the treatment. And if that patient moves to the other physician then he has to start his treatment from the initial point since his previous records are not maintained by the new physician. Many problems were faced by the patients like high amount of money incurred for tests and treatments and also the instant expenditure. In order to solve these problems faced by the patients as well as physicians, there is a need to develop an environment where these problems can be solved easily and effectively.

III. PROPOSED WORK

As discussed or reviewed from the literature related to this field and previous section, it is observed that many problems have been faced by the Physician along with patients. To overcome these problems, a new approach is proposed, i.e. telemetry system. It is a computerized communication procedure in which data is composed at remote or inaccessible point and transmitted to receiving apparatus for monitoring. The system comprises of small sensors:

- temperature sensor to sense the temperature of human body,
- heartbeat sensor to sense the heartbeat rate of the human heart and
- GSR i.e. Galvanic Skin Resistance sensor that detect the variation in the human skin which caused due to variations in the level of stress.

In this system all information of the patients has been stored on the server with the help of IoT (Internet of Things) device so that it can be accessed or available to each and every physician. This method is very useful for the patients and physicians, because it accumulates the time and money of the patients. So, both the physicians and patients can access the information easily regarding patient, anytime and anywhere.

IV. METHODOLOGY

In this paper, the proposed method uses a microcontroller as a gateway to communicate with a variety of sensors such as temperature sensor, Heart Beat sensor.
The microcontroller collects the sensed data and sends it to the network, thereby providing real-time monitoring of the healthcare parameters for the physician. Data can be accessed by the doctor at any time. The controller warns the consultant about the change in sensor output.

However, the main problem with the remote patient monitoring system is to securely transmit the data to the destination and to allow only authorized access of the data. Security concerns are addressed by sending data through encrypted Password Protected Global Mobile Communication System (GSM) module and the user/physician accesses the data by logging on an html webpage connected to the server. A warning message is sent to the doctor through the GSM module in any condition when any change or problem occurs. Therefore, rapid provisional medication can be easily performed by this system. This system is efficient and has an excellent time response.

1. Initially the patient’s temperature, Heartbeat data is sensed through the sensors which forwards the data to the micro-controller.
2. When the micro-controller receives the information about a patient, then it forwards the gathered data to the IoT Module.
3. Once the IoT module collects data from the controller, it then precedes the data to the server through telemetry system.
4. With the use of this system, data is stored on the server which can be used by the patient and the dedicated physician in future.
5. GSM module is responsible for sending and receiving of data from the server securely.

V. RESULTS AND DISCUSSION

The idea behind the implementation of the proposed work is to monitor and record the patient’s health parameters so that it can be used in near future for the purpose of analysis. The table below shows the values observed corresponding to the heartbeat of the patients as recorded by the system.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Value</th>
<th>Created Date</th>
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<td>9</td>
<td>12</td>
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<tr>
<td>10</td>
<td>29</td>
<td>2017-04-29</td>
<td>04:40:46</td>
</tr>
</tbody>
</table>

Table1: Values of Heartbeat
And the graph represented in figure 2 is formed on the basis of the table 1.

![Graph of Heart Beat Sensor per date](image)

*Figure 2: Graph of patient’s Heartbeat*

Similarly the table 2 represents the values of the temperature of the patient and the figure 3 is the related graphical presentation of the temperature recorded by the system.

**Table 2 Values of the temperature**

<table>
<thead>
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The graph in figure 3 is represented on the basis of dates on which the information related to the temperature of patient is created. Here x axis depicts the date and y axis shows the temperature which ranges from 0 to 35.

![Graph of Temperature Sensor per date](image)

**Figure 3 : Graph of temperature**

The graph below depicts the values that are sensed by GSR sensor.

![Graph of GSR per date](image)

**Figure 4: Graph of GSR values**

VI. CONCLUSION

It is concluded that paper provides or proposed a new IoT based patient’s health parameter recording system which can be accessible by the physicians of an organization. The system works by sensing the heartbeat rate, temperature of the patient and constantly saves the updated data to the server of the system. This system is proposed in order to reduce the burden of the patients when they visit to the physician but concerned physician is not able to attend the patient, hence patient have to move to
another physician then the new physician can start the treatment of the patient by accessing the related data or records from the server.

REFERENCES