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BIOMEDICAL SENSORS BASED MONITORING SYSTEM

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ABSTRACT

Electricity-operated durable medical equipment (DME), such as ventilators, dialysis machines, and patient monitoring devices, are life-supporting machines used extensively by patients at home. While convenient and economical, at-home use of DME is susceptible to power outages, especially the ones caused by natural disasters that often occur in large area and for a long duration. There is little existing technology allowing hospitals to monitor DME-dependent patients without using the current infrastructure, such as the landlines, the cell towers, Ethernet cable or the Internet. Reported herein is a novel wireless system that utilizes a radio ad hoc network to automatically report the patient's information and location, and the DME information and status to a nearby hospital when a power outage is detected.

This system consists of two parts: a hospital-based receiving device, called the Base Station node, and multiple transmitting devices, called User Nodes, each connected to the DME at patients' homes. The Base Station and User Nodes is each built with a Teensy® microcontroller, a GPRS receiver module, and an Xbee® radio implementing the ZigBee protocol. Additionally, each User Node contains a status LED and an internal lithium-ion battery connected by a charge controller. User Nodes are programmed to obtain the GPRS monitor the DME status, communicate with nearby nodes, transmit the data and relay information to the Base Station through the radio ad hoc network the nodes form in the case of a power outage.

Keywords: DME,GPRS, LED, Radio Ad Hoc Network.

I. INTRODUCTION

Durable medical equipment (DME) is any medical device used at home by patients for monitoring and/or treating diseases. There are two types of DME: passive equipment and active equipment, the latter reliant on electricity to operate. Life-supporting active DME include dialysis machines, ventilators, oxygen concentrators, etc. At-home use of DME is not only convenient and economical, but also leads to a better quality of life for the patient. In a 2013 survey, the World Health Organization (WHO) estimated that in Japan alone, there are 13,000 DME in use, namely 101 DME users per million populations. DME are heavily used in the United States although a specific number is not available due to privacy laws.Despite aforementioned benefits, at-home DME are susceptible to power outages, especially those caused by natural disasters. During difficult times like this, the DME dependent patients had to face the life-threatening situation because their machines had stopped functioning. While most at-home DME are equipped with integrated batteries to keep them functioning during power outages, their rechargeable batteries typically last only 1 hour with lead-acid batteries and 2-3 hours with newer lithium-ion batteries. Thus, there is a critical need for a means of communication between the medical staff at a hospital and patients at home during natural disasters without needing current infrastructure such as landlines or cell towers that are often unavailable during natural disasters.

The last few decades have witnessed a steady increase in life expectancy in many parts of the world leading to a sharp rise in the number of elderly people. A recent report from United Nations predicted that there will be 2 billion (22% of the world population) older people by 2050.In addition; research indicates that about 89% of the aged people are likely to live independently. However, medical research surveys found that about 80% of the aged people older than 65 suffers from at least one chronic disease causing many aged people to have difficulty in taking care of them. The rapid proliferation of information and communication technologies is enabling innovative healthcare solutions and tools that show promise in addressing therefore said challenges. Now,

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Internet of Things (IoT) has become one of the most powerful communication paradigms of the 21th century. In the IoT environment, all objects in our daily life become part of the internet due to their communication and computing capabilities (including micro controllers, transceivers for digital communication). In healthcare system, IoT involves many kinds of cheap sensors (wearable, implanted, and environment) that enable aged people to enjoy modern medical healthcare services anywhere, any time. Besides, it also greatly improves aged peoples quality of life. The body sensor network (BSN) technology is one of the most imperative technologies used in IoT-based modern healthcare system. It is basically a collection of low-power and lightweight wireless sensor nodes that are used to monitor the human body functions and surrounding environment.

II. EXISTING METHOD:

The recent advancements in technology and the availability of the Internet make it possible to connect various devices that can communicate with each other and share data. The Internet of Things (IoT) is a new concept that allows users to connect various sensors and smart devices to collect real-time data from the environment. In this project, our contribution is twofold. Firstly, we critically evaluate the existing literature, which discusses the effective ways to deploy IoT in the field of medical and smart health care. Secondly, we propose a new semantic model for patients' e-Health. The proposed model named as 'k-Healthcare' makes use of 4 layers; the sensor layer, the network layer, the Internet layer and the services layer. All layers cooperate with each other effectively and efficiently to provide a platform for accessing patients' health data using smart phones. Falls are dangerous for the aged people as they can adversely affect health. Therefore, many fall detection systems have been developed. However, in existing system we used only accelerometers to isolate falls from activities of daily living. Body orientation is also used as a means of detecting falls, but it is not very useful when the ending position is not horizontal, e.g. falls.

III. PROPOSED SYSTEM

In this paper we present a novel system using sensors and ZIGBEE are attached to person. ECG is used to measure the heart beat rate of the person. Once the controller gets the information from these devices information to nurse node as well as nearby hospital zones using ZIGBEE and nurse node sends the data to web page with the help of GPRS.

IV. BLOCK DIAGRAM

Patient Transmitter

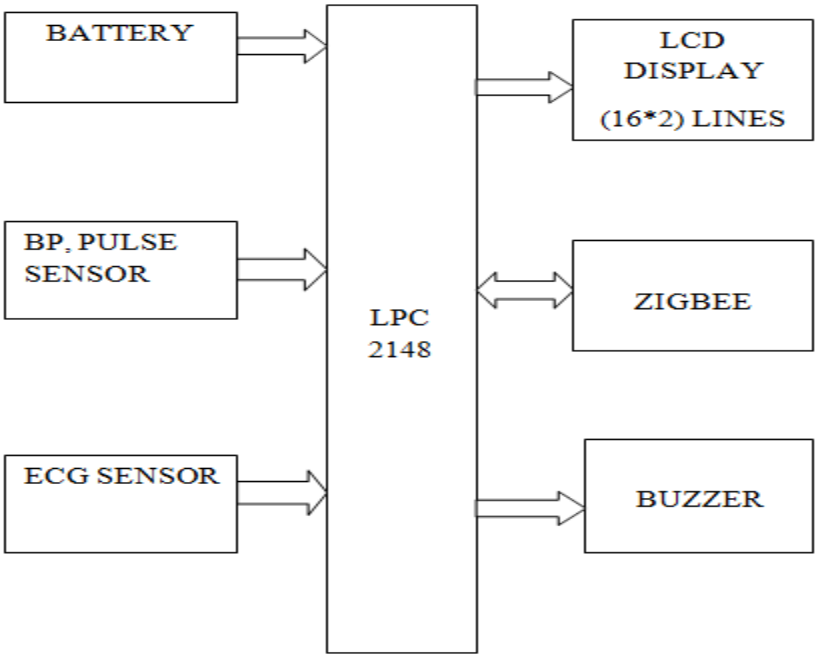

Figure 4.1: Block Diagram of Parent Transmitter

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Monitor Section

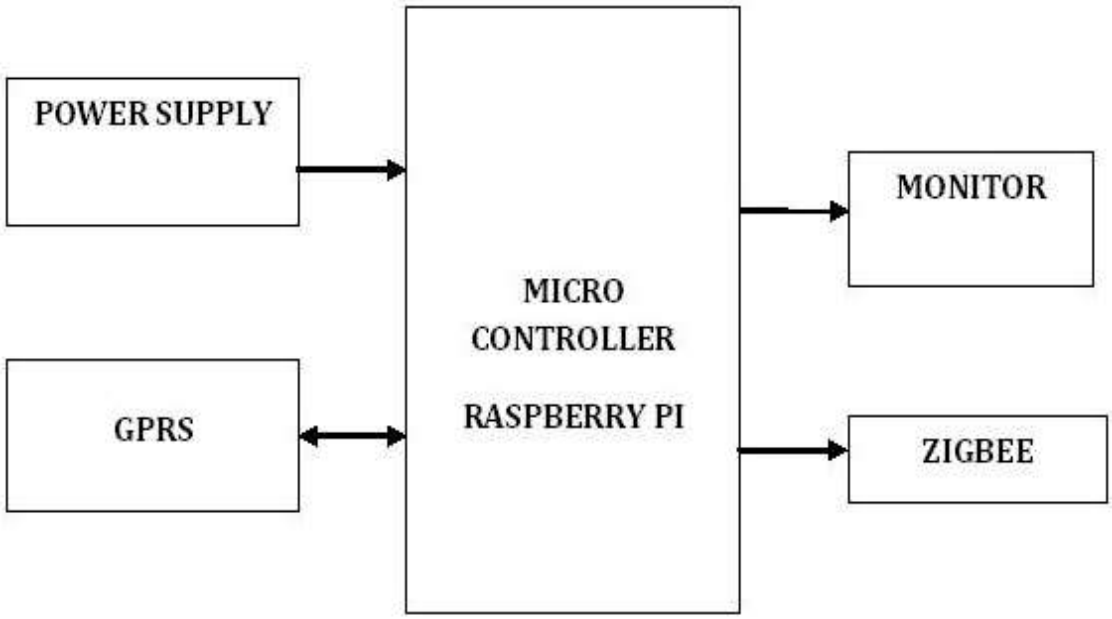

Figure 4.2: Block Diagram of Monitor Section

V. SCHEMATIC DIAGRAM AND FLOW CHART

Patient Section:

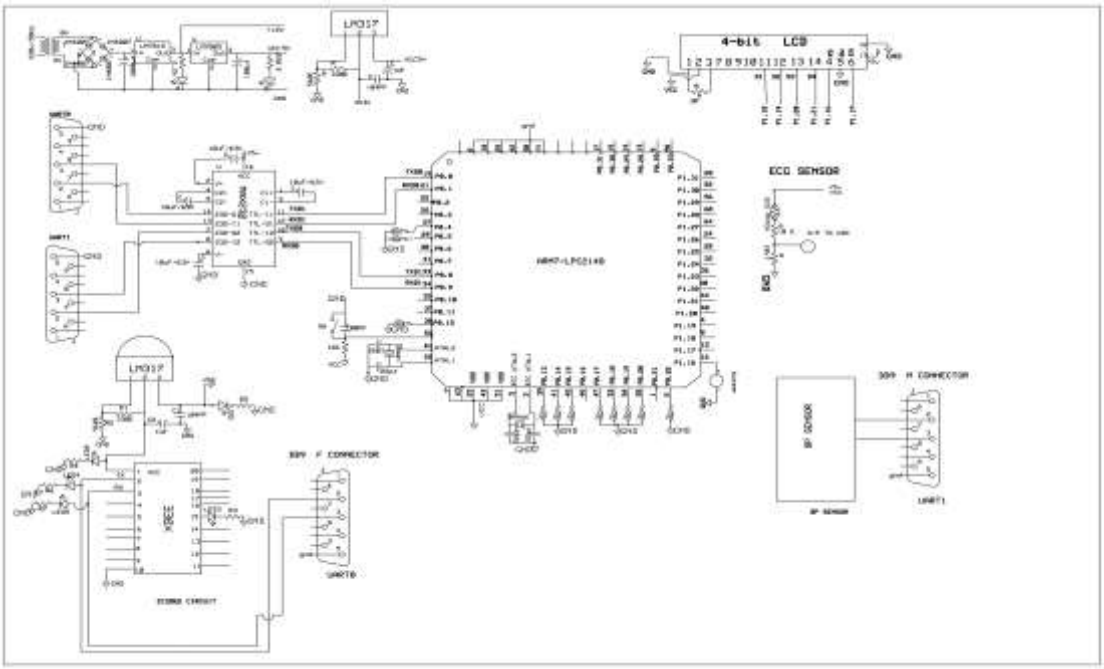

Figure 5: Patient Section

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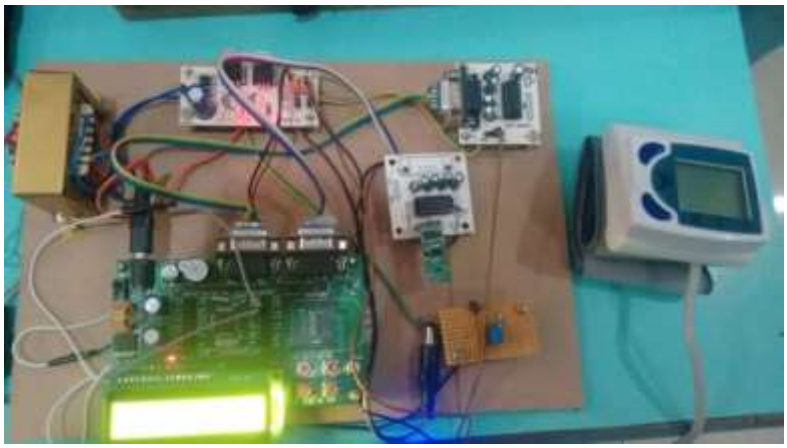
VI. RESULT ANALYSIS

Patient transmitter section:



BP sensor module

Display the BP, ECG and temp on LCD

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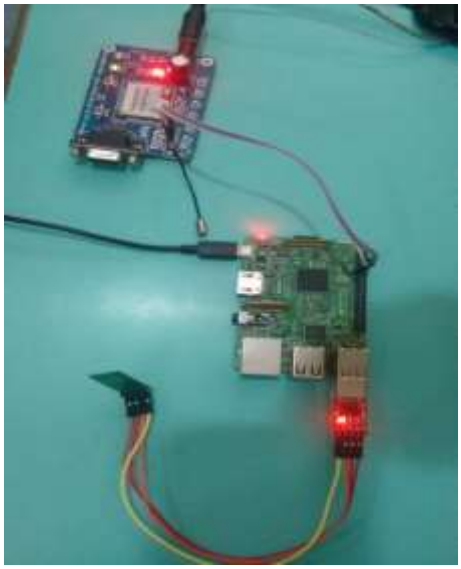
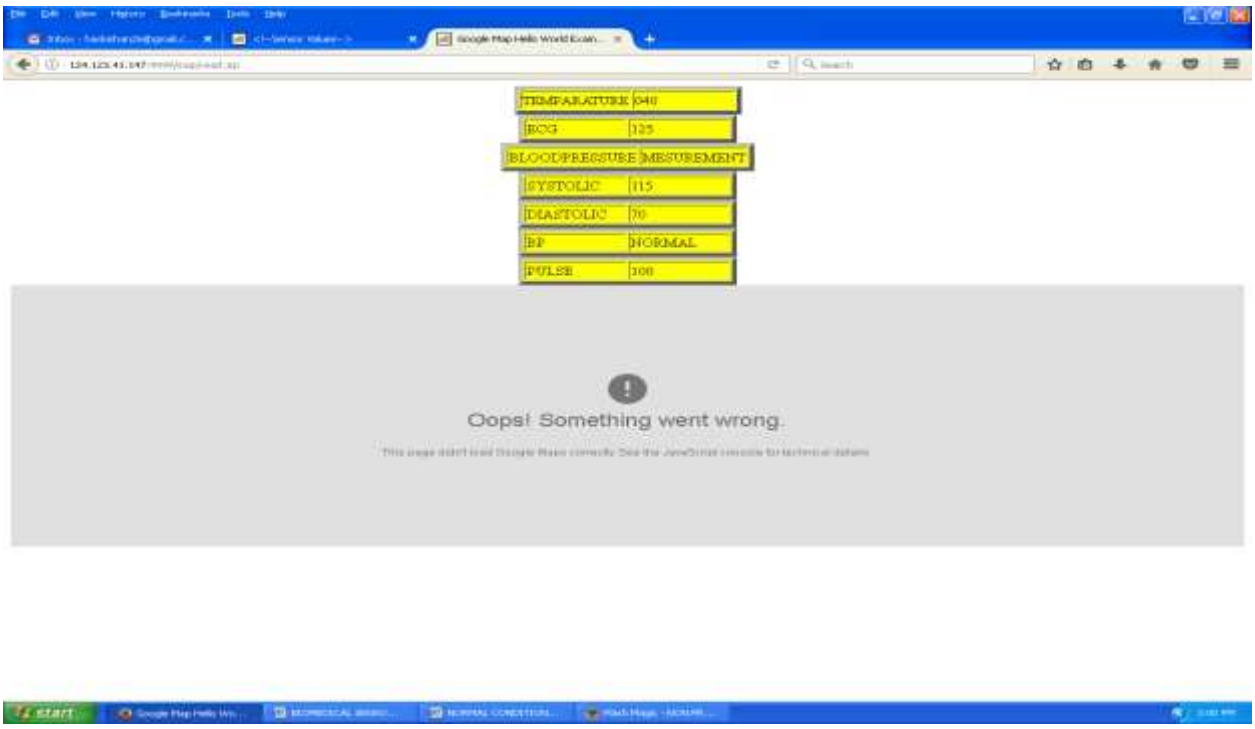
Monitor section



Result analysis

Normal conditions



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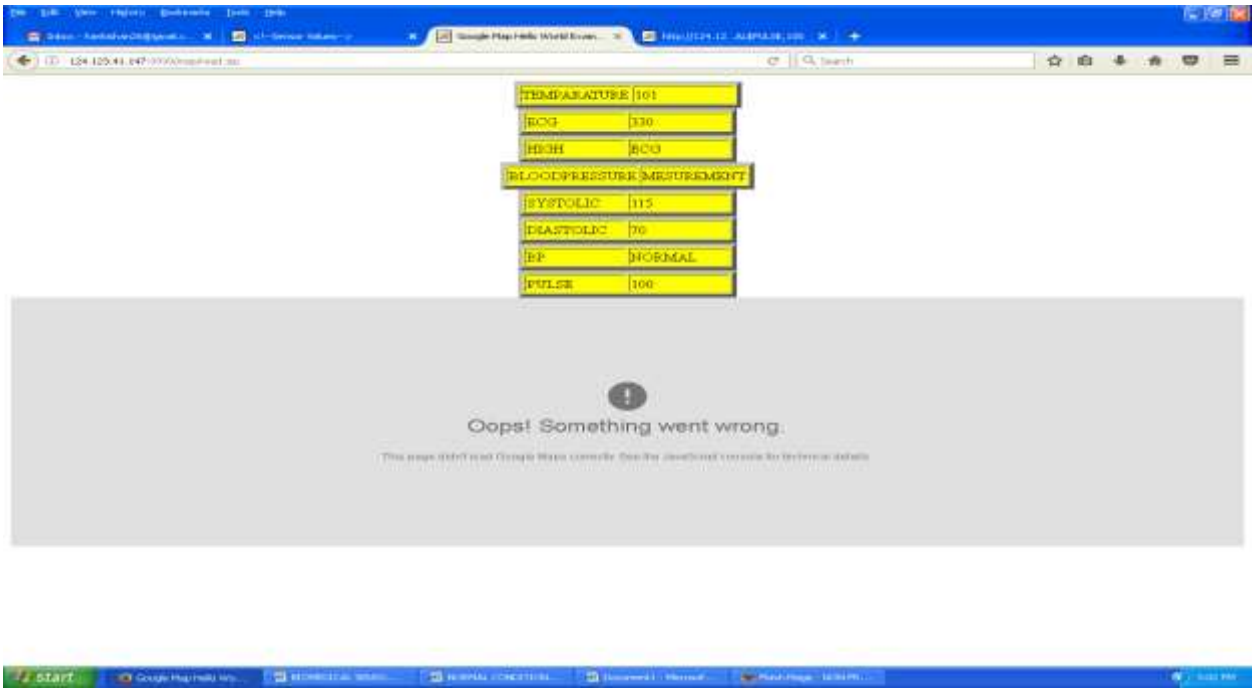
High temperature

High ECG



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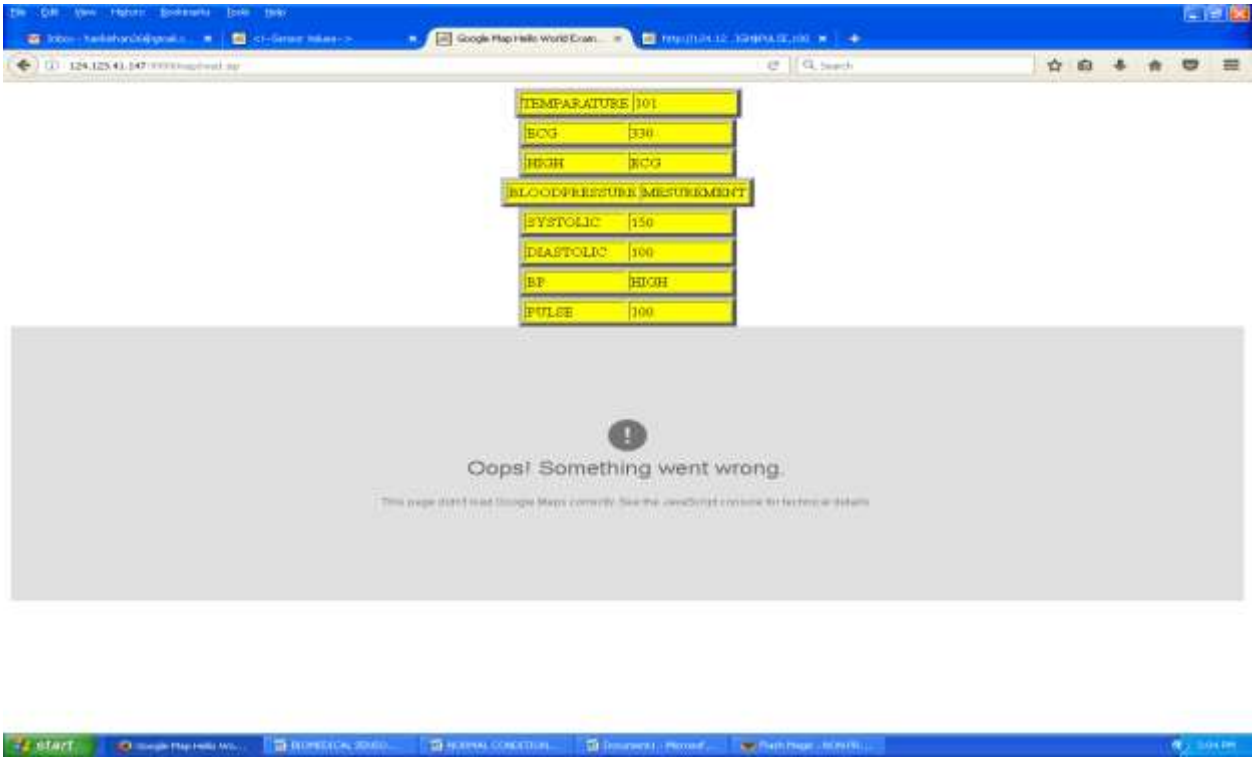
High BP



VII. CONCLUSION & FUTURE SCOPE

Conclusion

The paper "**BIOMEDICAL SENSORS BASED REMOTE MONITORING SYSTEM**" has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the paper has been successfully implemented.

Future Scope

In future we can develop this project in the distributed medical system linking different medical entities and systems like hospitals, emergency units, general practitioner cabinets, laboratories, personnel and patients. The implemented system is web based using ontology and can provide different services such as remote monitoring, online consultations, and hospital activity administration.

VIII. REFERENCES

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