IoT and Renewable Energy systems based Connected Chair for Health Monitoring

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ABSTRACT

Health monitoring of a system involve in various activities done in order to make the system operating condition feasible with certain constrains such as current systems states which includes repair and maintenance of the observations. Remote health monitoring is a process in which patients with numerous conditions such a heart disease or diabetics are monitored based on the latest technology. Internet of things and renewable energy sources are the brain of this work based smart wheel chair for special people for autonomous movement and also gathering person’s health information using smart sensors displayed in webpage. For this innovative work a digital single board computer for gathering sensor information and also transfer the status of the persons through inbuilt Wi-Fi, and also the smart chair movement dependent upon user’s voice, which the sceneries are recognized by connected camera to raspberry pi. Renewable energy system such as PV array or wind energy systems can be replaced for supply of the entire health monitoring system and connected chair system.

Keywords: Raspberry pi, Internet of Things, sensor, Health monitoring, smart chair monitoring, renewable energy system.

INTRODUCTION:

Human being health is primary element for their survival. Growth of the society and growth of the individual primarily depends on the health of the human being. Health of the individual includes the fitness of mental and physical development which is an important parameter. Global health organization has issued lot of concern regarding individual health issues [1]. Due to population aging, chronic diseases existence and increasing cost of the medical expenses the health care of an individual plays a burden factor. Because of these challenging factors many researches are performing various innovative studies and solutions to invent new innovative solutions and new technologies to find a solution for the above said challenging issues. Patient disease management and detection plays an important innovative invention for the improved health quality of the individual [2].

Nowadays lot of devices such as wearable sensors are available commercially to take care of the health of the individuals. Even devices are available to take care of the fitness, personal health care and fitness awareness. In addition remote health monitoring also available in existence to monitor the fitness arena, long term recording of the health system and management and patient’s physiological information. Technologies are developed to monitor the clinical healthiness of the individual and group of individual. Based on the trends of the current
technology the routine physical examination and physiological monitoring and be done in present and future time domain using wearable sensors and other equipments in and inexpensive way [3]

Interaction of the things with internet or cloud involving various sensors, micro controller, microprocessor, transmitters and receivers is known as Internet of Things (IoT). The transceivers are meant for empowering the communication and the required introduce the necessary protocol stacks to built and interact with each other and with far of communication users or devices. Nowadays, Internet of things have become the part of the day to day life and happenings. All the medical and health monitoring applications make use of Internet of Thing in the day to day activity of everyday life. In view of these things IoT are developed in every physical object is connected to the Internet by employing sensor devices. The health care monitoring system using Internet of Things and its need are increasing to take care of the patients day by day to increase and strengthen their health care and reduce the cost of health monitoring of individual [4].

In recent years to facilitate the remote health monitoring during emergency situations Internet of Things (IoT) devices are widely used in various advanced healthcare systems. At the present many challenges are faced by the individual in the real world, which need to be solved and solution to be arrived to deal realistically. The manpower and time consumption are more important challenges in IoT. The Internet of things rehabilitation of resources has become prominent and popular for the development of the smart IoT applications like smart home and smart devices and equipments. On comparing the traditional system with existing system the aim of smart rehabilitation is an effective treatment for providing solution aiming sufficient interaction and quick reconfiguration. To determine the probable use of the medical resources, equipments and sensors according to the patient’s requirements and the diseases encountered by the patients. For interconnecting all the medical resources and devices of the rehabilitation systems the primary and important technology are included by having sensors and wearable devices. For wide range of application the network technologies are used and implemented to interact and communicate among themselves [5]. In this paper the status of the patient along with orientation of the wheel chair according to voice of the user.

The proposed framework manages the way toward controlling and monitoring wheel chair and also health information of user with the idea of IOT and Computer Vision. The working model of connected chair for health monitoring through IOT and computer vision is explained below.

Input block comprises of MEMS sensors, temperature sensors, USB camera, Raspberry Pi and analog to digital converter.

MEMS SENSOR (ADXL335):
MEMS sensor is to monitor the orientation of the wheel if the wheel starts skids it sends alert message to the person.

TEMPERATURE SENSOR:
Temperature sensor is to monitor the temperature of the person. If the temperature of the person rises it sends the message.

USB CAMERA:
Webcam is used for real time monitoring of the patients health.
ADCMCP3008:

Analog values are converted into digital values using the device analog to digital converters. The analog values measurement of temperature sensor and MEMS sensor are converted into digital values for giving as input.

BLOCK DIAGRAM:

![Block Diagram of existing system](image)

**RASPBERY PI:**

Raspberry pi is used to interface the Temperature sensor, MEMS sensor, L293D dc motor. Raspberry pi is good at software applications and can run multiple programs at a time. It stores the program in SD card.

**OUTPUT BLOCK:**

**L293DMOTORDRIVER:**

This motor driver IC is used for rotation of the wheel according to the voice input of the user. If the user wants to move the wheel chair by using the voice as input they can move forward, backward, right, left and stop.

**WORKING DESCRIPTION**

The Raspberry Pi is a three microchip reads the input from USB cam and build the wheel chair move in specific direction given by the user and conjointly the sensors conjointly monitored the user’s physical parameters to observance.

In the existing work the wheelchair is controlled through IoT employing an android application which is connecting via Wi-Fi module and through button system which is fixed on the hands of the chair. The dependency of the user will decrease due to this application. The wheel chair is employed with MEMS sensor to
sense and avoid the accidents which causes due to obstacles in real or remote location. The sensors on detecting the obstacle will act immediately and the commands recorded will be communicated to the heart of the hardware module microcontroller for further processing and further motion. The doctor can monitor the information’s and data which are communicated by the health monitoring system and by which necessary action can be taken by the doctor to cure the respective patients.

Wheelchair is provided with four wheels in all the four directions, two rear wheels and two castor wheels. The two caster wheel are fixed in front of the wheel chair, and all the wheels are designed in such a way having the same diameter. The drive wheels are designed in rear side of the base of the vehicle in such a way that, chair is allowed to turn according to voice command enabled by the system and the wheels are engaged directly to a gear train that transmit torque form motor to wheels by two grooves in each wheel and nut.

HARDWARE IMPLEMENTATION

In the hardware design all the sensors are placed on the seat for visibility. The programming is done using Python Language through an open source LINUX Software.

![Figure 2. Hardware Design of the existing system](image)

The following table shows the list of components and their corresponding specifications used to design the hardware kit.

| NAME                | SPECIFICATION |
|---------------------|---------------|
| Raspberry Pi        | MODEL 3 B     |
| Motor Driver        | L293D         |
| Mems Sensor         | ADXL335       |
| ADC                 | MCP3008       |
| Temperature Sensor  | LM35          |
The Python language is used to program using Linux Software which is an open source. All the sensors are individually programmed according to the consumers’ requirement. The pins used here are called the GPIO pins. The sensors after programming is connected to the Raspberry Pi.

EXPERIMENTAL RESULTS:

The outputs of the sensors are taken from the Raspberry Pi. This output is made to be displayed in the browser for doctors’ use. For security purpose the output is viewed in the browser only when the IP address of the particular patient is entered. Since IP address is used it can be viewed in Laptop, mobile phone or any gadget.
CONCLUSION

A unique model of wheelchair for future IoT-based health monitoring systems was designed and which can be applied to both general systems and systems that monitor specific conditions. This designed model can be used in hospitals as indoor application effectively for monitoring the health condition of patients admitted from the doctors place itself. The doctor can answer emergencies without intimation of helper. The alert system helps to provide immediate service to the patient. Accidents can drastically be reduced through this system. The proposed system of patient health monitoring can be highly used in emergency situations as it can be daily monitored, recorded and stored as a database. The IOT device is combined with the computer vision so that the database can be shared in all the hospitals for the intensive care and treatment. Renewable energy system such as PV array or wind energy systems can be replaced for supply of the entire health monitoring system and connected chair system.

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