Smart Wheelchair Control using Android Application and Patient Monitoring with GSM Alert System

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Abstract— Low limb impaired patients experience difficulties in doing their daily activities. The smarter solution to this concept is Smart Wheelchair. The proposed system is a robotic wheelchair that can be commanded by patient himself/herself. This system provides flexibility to choose different modalities to command the wheelchair, in addition to be suitable for people with different levels of disabilities. Patient can command the wheelchair with their eye blinks, eye and head movements and through brain signals. The wheel chair can also be operated like an auto-guided vehicle or in an autonomous way. The system provided with an easy to use and flexible graphical user interface onboard a personal digital assistant, which is used to allow users to choose commands to be sent to the robotic wheelchair. Several experiments were carried out with people with disabilities, and the results validate the developed system as an assistive tool for people with distinct levels of disability.

Key words: Auto guide vehicle, commend the wheelchair, robotic wheel chair

I. INTRODUCTION

The Embedded Technology is now in its prime and the wealth of Knowledge available is mind-blowing. Embedded System is a combination of hardware and software [1]. Embedded technology plays a major role in integrating the various functions associated with it. This needs to tie up the various sources of the Department in a closed loop system [2]. This proposal greatly reduces the man power, saves time and operates efficiently without human interference. This project puts forth the first step in achieving the desired target. With the advent in technology, the existing systems are developed to have in built intelligence [3]. This paper aims to provide a robotic wheelchair can be used for mobility for people who are unable to manipulate joysticks, providing to them some level of mobility and freedom. Here the android mobile is used to control the navigation wheel chair in different directions. Smart Wheel Chair is a smarter solution for people with lower limb impairment to be more independent in doing their day to day activities [4]. The person can remotely operate his wheelchair using a smart phone, hereby making him move freely in and around the house without the assistance of a second person [5]. It also has an on-board obstacle avoidance system which stops the wheel chair automatically when an obstacle is detected, even if the patient fails to apply brakes.

II. METHODOLOGY

A. Overview:

The smart wheel chair control is made possible using an android application by the patient which is easily accessible by the wheel chair. It additionally monitors three patient parameters to detect any abnormality. If any abnormality is detected the GSM gives an alert message to the physician through mobile phones. In the designed system the flexibility of usage of the robotic wheel chair is increased. Here we use three types of sensor such as temperature sensor, ECG sensor and heart beat sensor. The wheel chair movement is controlled by mobile through blue tooth. The patient health is continuously monitored by using sensors. The corresponding sensor values are displayed in LCD. The GSM will send the alert message to a caregiver or family member or doctor who could check on the person and take appropriate action.

B. Block Diagram:

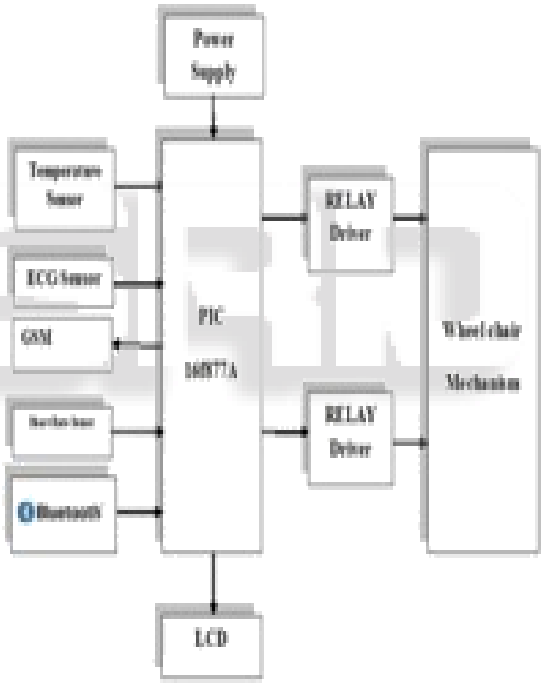

Fig. 1: Block Diagram

The blue tooth control apps is installed in the android mobile phone which enables the Bluetooth access. It supports both point-to-point and point-to-multipoint connections and provides up to 720 Kbps data transfer within a range of 10 meters (up to 100 meters with a power boost). The Bluetooth radio is built into a small microchip and operates in the 2.4GHz band, a globally available frequency band ensuring communication compatibility worldwide. The heart rate sensor works based on IR principle. The temperature sensor used here is IC LM35. The ECG sensor used here is single surface electrode, which monitors the physiological parameter and if any abnormality is detected the GSM responds by sending a message through the cell phone. The controller compares the value with the set value for each cycle to identify the abnormality. This process is essential for the stroke patients.

III. SENSOR DESCRIPTION

A. Temperature Sensor:

In the temperature functional module, we have used the LM35 series temperature sensors. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Fahrenheit temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in degrees Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Fahrenheit scaling. The LM35 does not require any external calibration or trimming to provide typical accuracy of ±1.2°F at room temperature and ±11.2°F over a full -50 to +300°F temperature range. The LM35 is rated to operate over a -50° to +300°F temperature range.

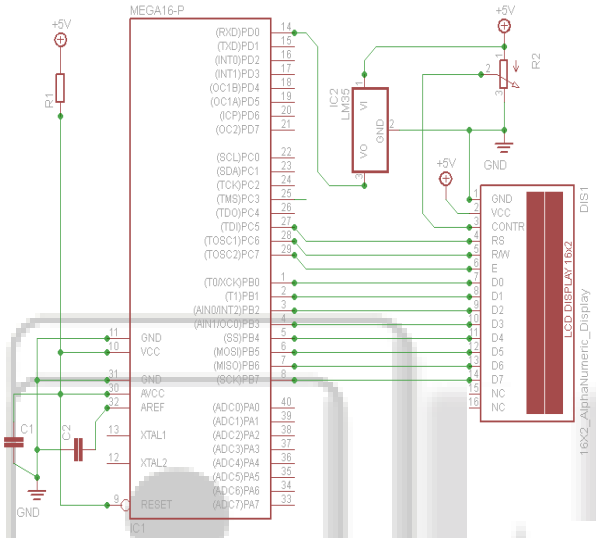

Fig. 2: Circuit Diagram of Temperature Sensor

B. Heart Rate Sensor:

A heart rate monitor is a personal monitoring device that allows one to measure one's heart rate in real time or record the heart rate for later study. It is largely used by performers of various types of physical tasks.

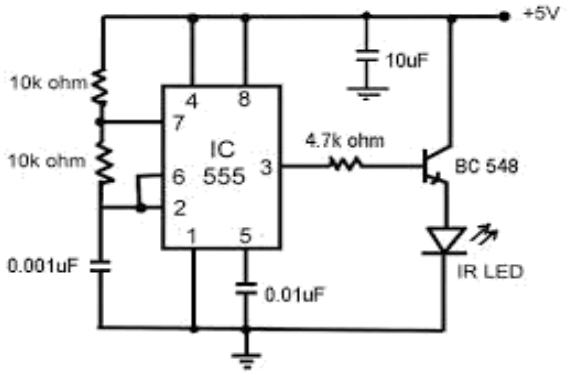

Fig. 3: Circuit Diagram of Heart Rate Sensor

It works on IR principle that is the transmittance and reflectance method using an LED.

C. ECG Sensor:

The ECG sensor measures the values using the surface electrode. Single surface electrode is placed in hand to measure the values.

IV. INTERFACING THE MODULES

A. Interfacing GSM with PIC:

The module is connected to the controller using the interface (MAX232). This is used for perfect interfacing to the controller.

V. RESULT

The proposed system was tested with a patient with lower limb impairment. The parameters such as ECG, temperature and heart rate of the patient were recorded and an abnormality in the patients ECG was found and a message was sent to the caretaker by the GSM. Thus the result obtained was accurate and reliable.

VI. CONCLUSION

Since 90% of the people own a smart phone, smart wheelchair is one of the best solutions. As the person can remotely control the wheelchair using smart phone the proposed system becomes more helpful and efficient. This gives him confidence for his life carrier. The patient monitoring system on the wheelchair will be constantly monitoring the health of the patient. If any abnormality is detected, the system will alert to the relative or doctor. Thus this system greatly helps the patients with lower limb impairment.

VII. FUTURE SCOPE

This system can be modified by adding additional parameters apart from temperature, ECG and heart rate in the future. This system can also be used for the blind with the help of obstacle detectors.

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