



Hand Gesture Controlled Wheelchair

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Abstract: The smart wheelchair is an attempt to make the lives of the physically disabled people simple, it means self-reliant. The purpose of this idea is to reduce the necessity of the assistance. For this, a hand gesture based system has been developed to control the movement of wheelchair using movement of hand. For safety purpose, an ultrasonic sensor is used to detect obstacle and avoid collisions. In addition to that, a health monitoring system is also implemented to check the health status of the user.

Keywords: Raspberry Pi 3, Hand Gesture, Obstacle Detection, Health Monitoring, OpenCV.

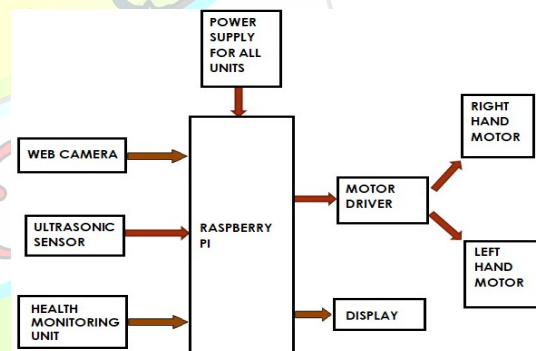
I. INTRODUCTION

Nowadays there is a growing demand for human friendly wheelchairs as mobility aids for physically disabled people. The motorized wheelchairs are useful for those who are unable to drive a manual wheelchair or who may need to use a wheelchair for distances which would be difficult in a manual wheelchair. The needs of the elderly and disabled people who have restricted limb movements due to the diseases like Parkinson's and quadriplegics cannot be satisfied by the existing motorized wheelchair that uses joystick as the main control device.

The scope of the project is to control the wheelchair using hand gesture. One of the common communication media that people use effectively and understand properly in our daily life is the gestures shown by hand. The growing research and technology uses the hand gesture for interaction between human and machine.

There were several techniques used for gesture recognition, such as instrumented glove, optical markers, etc.

II. BLOCK DIAGRAM



A. Description:

This block diagram consists of web camera to get the image of hand gestures. The images obtained are processed using openCV software. This output is given to the Raspberry Pi to control the movement of wheelchair. An ultrasonic sensor is mounted in front of the wheelchair to detect obstacle and avoid collisions. A health monitoring system is included that displays the health status of the user.

B. Raspberry pi 3:

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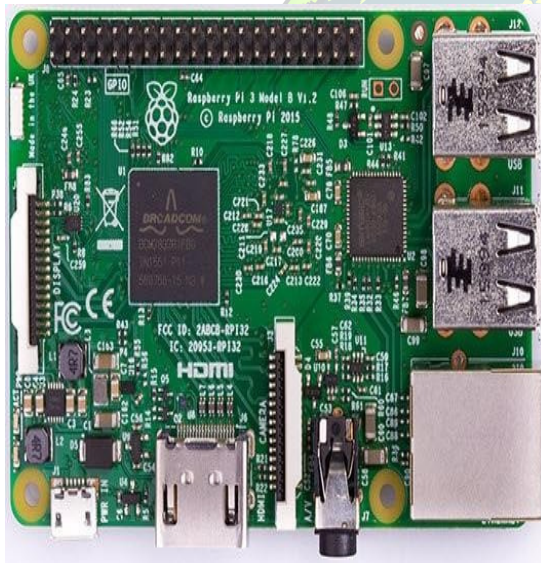
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The Raspberry Pi 3 Model B is the third generation Pi. This powerful credit-card sized board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2

Model B. While maintaining the popular board format the Raspberry Pi 3 Model B brings you more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN and Bluetooth connectivity making it the ideal solution for powerful connected designs.



OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, IOS, and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications.

B. Python

Python is an interpreted high-level programming language for general purpose programming. Object oriented programming and structured programming are fully supported and many of its features supported functional programming. It has a syntax that allows programmers to express concepts in fewer lines. Unlike many other languages, it does not use curly brackets to delimit blocks.

HAND GESTURE CONTROL:

This project implements a hand gesture recognition system using OpenCV on python. A histogram based approach is used to separate out hand from the background. Background cancellation techniques are used to obtain optimum results. The detected hand is then processed and modeled by finding contours and convex hull to recognize finger and palm positions and dimensions. Finally, a gesture object is created from recognized pattern which is compared to a defined gesture dictionary.

Software:

A. OpenCV

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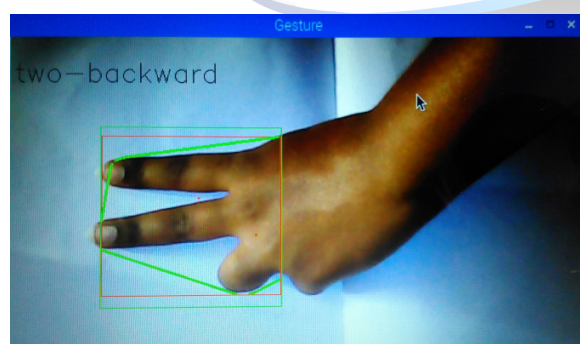
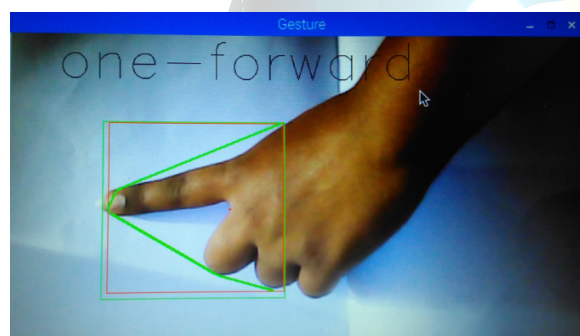
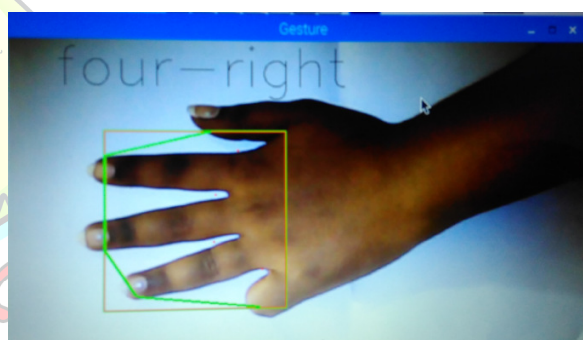
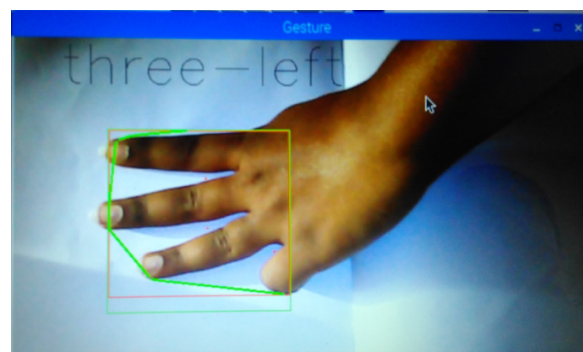
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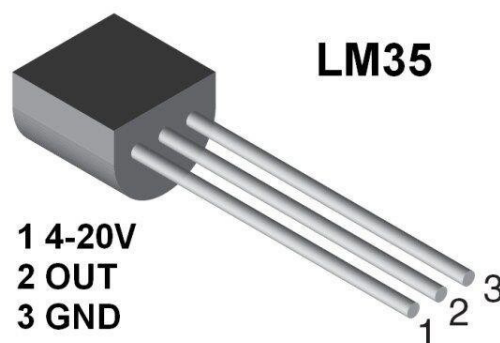
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Hand gesture	Wheelchair movement
	Forward
	Backward
	Left
	Right
	Stop



HEALTH MONITORING SYSTEM:

In this project, health monitoring system is included to monitor the health of the wheelchair user. It measures the patient's parameter such as temperature, heart rate and pressure using the different available sensors. The information gathered from the sensor can be transmitted wirelessly. The database is created to store these parameters and displayed in a website. The data can be accessed only by authorized personnel who may be a doctor or patient's



LM35

1 4-20V
2 OUT
3 GND

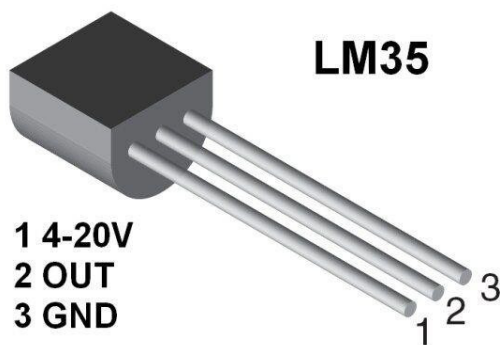
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B. Pulse sensor:



The heartbeat sensor consists of an infrared LED on one side and a photodiode on other side to detect the pulse of the finger. When light source illuminates the tissue, the reflected rays are being captured by the photodiode. The output of the detector is an electrical signal which basically gives the number of pulses counted by the sensor.

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III. FUTURE WORK

Further the project can be extended such that it can also be controlled through voice command. The health monitoring system can be improved by adding blood pressure and ECG sensor.

IV. CONCLUSION

This project is an updated one which can replace the commercially available wheelchair into an autonomous wheelchair with obstacle avoidance system. The main advantage is that this wheelchair can be controlled using hand gesture through image processing. Thus making the disabled people move independently. It also includes health monitoring unit with which health status can be analysed in the home itself.

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