RASPBERRY PI FOR HAND GESTURE RECOGNITION

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ABSTRACT

In this paper, a real time vision-based system is proposed to monitor objects (hand fingers). It is built based on the Raspberry Pi with camera module and programmed with Python programming Language supported by Open-Source Computer Vision (OpenCV) library.

It also contains a 5 inch 800*480 Resistive HDMI Touch screen for I/O data. The Raspberry Pi embeds with an image-processing algorithm called hand gesture, which monitors an object (hand fingers) with its extracted features. The essential aim of hand gesture recognition system is to establish a communication between human and computerized systems for the sake of control.

The recognized gestures are used to control the motion of a mobile robot in real-time. The mobile robot is built and tested to prove the effectiveness of the proposed algorithm. The robot motion and navigation satisfied with different directions: Forward, Backward, Right, Left and Stop. The recognition rate of the robotic system reached about 98.

INTRODUCTION

Vision-based and image processing systems has various applications in pattern recognition and moving robots' navigation. It is a processing of input images producing output that is features or parameters related to images.

Its application in robotics, surveillance, monitoring, tracking, and security systems makes it important and cover a wide range of applications worldwide. Object tracking is the main activity in computer vision and extracting its features is the basic principle. It has many applications in traffic control, human computer interaction, gesture recognition, augmented reality, and surveillance.

An efficient tracking algorithm will lead to the best performance of higher-level image tasks. Persons over the universe has been used a monitoring system for assisting them in securing territories or specific areas. It led to a system that has the ability of surveillance and applications in detecting and monitoring a known object. Raspberry pi is a small sized PC board suitable for real time projects.

The main purpose of the work presented in this paper is to make a system capable of detecting and monitoring some features for objects that specified according to an image processing algorithm using Raspberry Pi and camera module. The feature extraction algorithm programmed with Python supported by OpenCV libraries and executed with the Raspberry Pi attached with an external camera.

This system is working well even in poor illumination conditions. Hand gesture algorithm that embeds in the Raspberry Pi is used to steer a mobile robot implemented to get a vision-based robotic system that depends on human machine interaction.

SYSTEM IMPLEMENTATION

- Import the necessary packages: define the necessary packages that needed in this algorithm.

- Initialize the current frame of the video and define global variables.

- Capturing is done.

- Convert frame to grey scale, after that Blur and threshold.

- Then find out the contours.

- Find Convex Hull and points of defects.

- Draw Contours

SAMPLE SCREENS
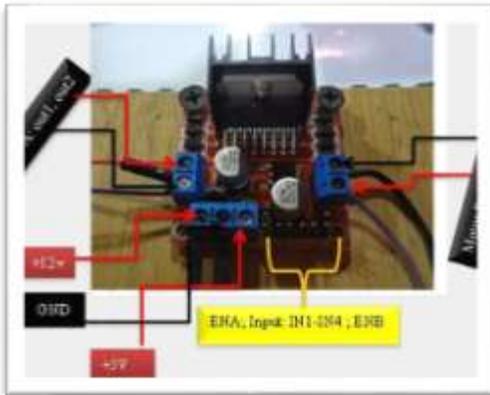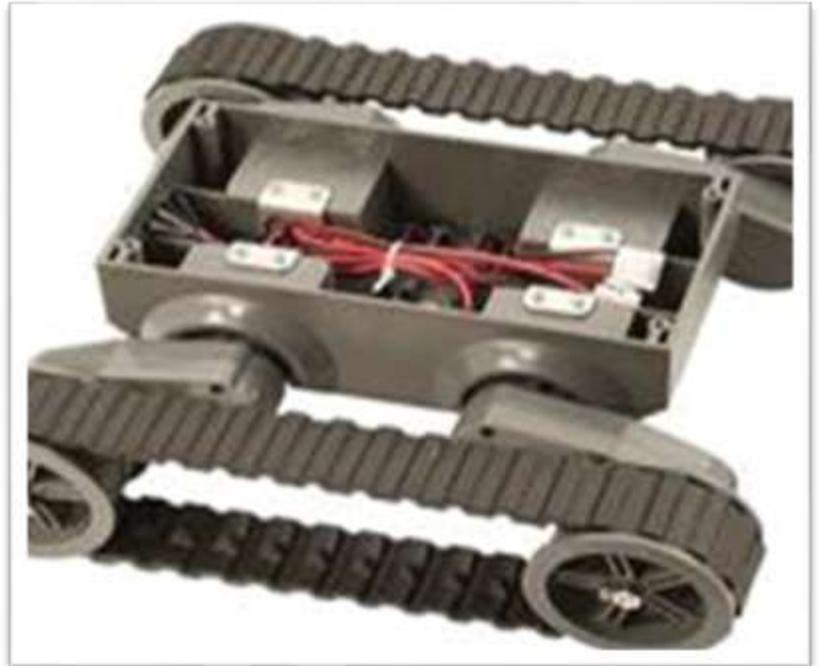
CONCLUSION

The performance of the presented algorithm is evaluated based on the recognition of hand gestures. The hand gesture algorithm did not used previously with Raspberry Pi for recognition and robot motion control. The database which used for human hand gesture recognition is supported with five types of gestures for five movements controlled with hand.

The experimental results showed that the designed system can be used for tracking and has a robust recognition level in detecting and recognition of hand of human by a low- cost computer interaction technique.

The real-time vision- based system is implemented efficiently with Python programming language, OpenCV libraries, Raspberry Pi computer device, camera module, and Linux-based LCD.

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