Hand Gesture Controlled Robotic System

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Abstract: Service robots directly interact with people, so finding a more natural and easy user interface is of fundamental importance. While earlier works have focused primarily on issues such as manipulation and navigation in the environment, few robotic systems are used with user friendly interfaces that possess the ability to control the robot by natural means. To facilitate a feasible solution to this requirement, we have implemented a system through which the user can give commands to a wireless robot using gestures. Through this method, the user can control or navigate the robot by using gestures of his/her palm, thereby interacting with the robotic system. The command signals are generated from these gestures using image processing. These signals are then passed to the robot to navigate it in the specified directions.

1. INTRODUCTION

In today's age, the robotic industry has been developing many new trends to increase the efficiency, accessibility and accuracy of the systems. Basic tasks could be jobs that are harmful to the human, repetitive jobs that are boring, stressful etc. Though robots can be a replacement to humans, they still need to be controlled by humans itself. Robots can be wired or wireless, both having a controller device. Both have pros and cons associated with them. Beyond controlling the robotic system through physical devices, recent method of gesture control has become very popular.

The main purpose of using gestures is that it provides a more natural way of controlling and provides a rich and intuitive form of interaction with the robotic system. This mainly involves Image Processing and Machine Learning for the system or application development. Beyond this, it also requires some kind of hardware for interfacing with the system for gesture control. There are some systems that have been developed in the same field using various techniques. Controlling can be done automatically or manually.
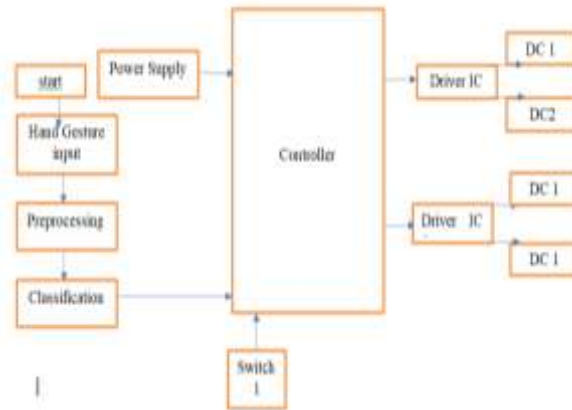
BLOCK DIAGRAM:

Fig 1: Block diagram of proposed system

2. DESCRIPTION:

The above fig.1 shows that Capturing Gesture Movements: Image frame is taken as input from the webcam on the control station and further processing is done on each input frame to detect hand palm. This involves some background constraints to identify the hand palm correctly with minimum noise in the image.

Hand Palm Detection After capturing the image frame from the webcam, some basic operations are performed on this frame to prepare it for further processing of command detection. These operations are necessary for implementing both the techniques of gesture control, following two main processes are done to detect hand palm

Thresholded Image: Image frame taken as input from webcam is thresholded starting from minimum thresh value till single contour is formed in an image, same is in the case of intensity based thresholding. That image is thresholded so that only a single contour can be formed on it. This thresholding is done on the basis of intensity in the image, which neglects the dark background and thresholds the fingers.

ARDUINO: It is heart of project. It controls the input and output devices.

DC SERVO MOTOR: DC Servo motors have lightweight, low-inertia armatures that respond quickly to excitation-voltage changes.

DC DRIVER: DC drive converts an Alternating Current (AC) into Direct Current (DC) to run a DC motor.

CONNECTING WIRES: Connecting wires allows an electrical current to travel from one point on a circuit to another.

Working:

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Command Detection using Specific Method: After completion of pre-processing of an input frame, further processing is done on the extracted image according to specified technique. These two methods of giving gesture commands are as follows.

1) Finger Count based Gesture Control
2) Direction of Hand Palm:
3) Generate Specific Signal

Generate Specific Signal: After detecting gesture command specific signal value is generated, unique for every gesture command. This signal value is written in the file using C++ file reading/writing functions.

Algorithm of System:
Step 1: Start
Step 2: Detect Finger
Step 3: Finger matched
Step 4: Found match finger is scanned.
Step 5: Supply power to arduino.
Step 6: transforming data and transfer to arduino
Step 7: Passes high/low signal to Driver Ic
Step 8: Driver IC controls the Motor Rotations
Step 9: execution successfully
Step 10: Stop.

3. RESULT:

The Gesture Controlled Robot System gives an alternative way of controlling robots. Gesture control being a more natural way of controlling devices makes control of robots more efficient and easy. We have provided two techniques for giving gesture input, finger count based gesture control and direction of hand palm based gesture control. In which each finger count specifies the command for the robot to navigate in specific direction in the environment and direction based technique directly gives the direction in which robot is to be moved. At a time any one of the method can be used according to user's reliability, without using any external hardware support for gesture input unlike specified existing system. After gesture recognition command signal is generated and passed to the robot and it moves in specified direction.

FLOW DIAGRAM OF HAND GESTURE ROBOTIC SYSTEM:
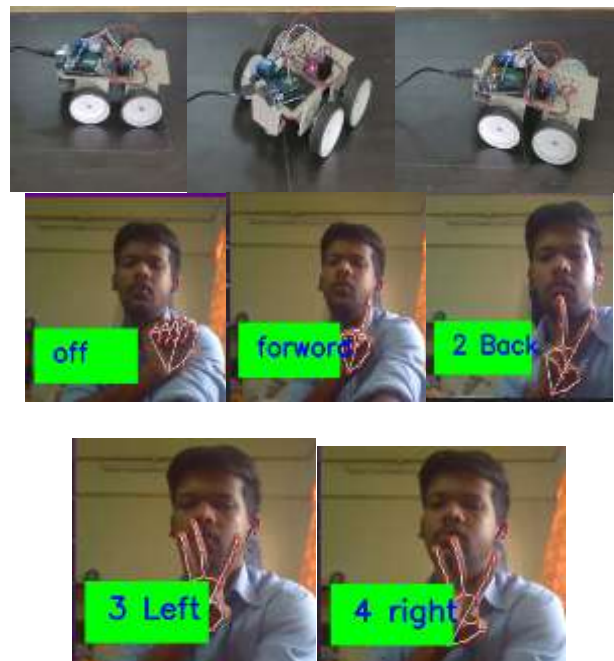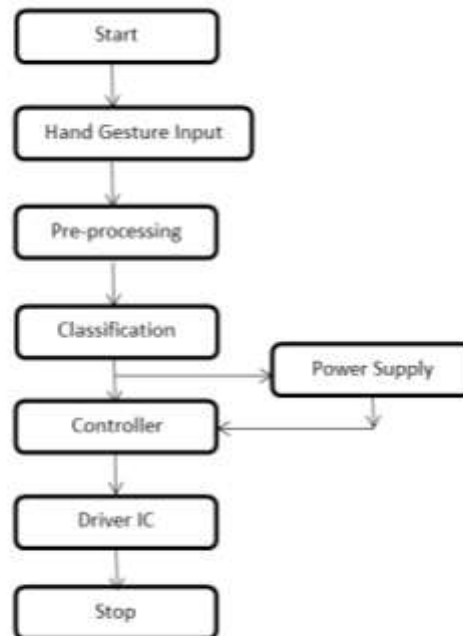
4. CONCLUSION:

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