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Hand Gesture Recognition for Controlling Vehicle Movements in Real-Time

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ABSTRACT

Gesture recognition can be termed as a process by which the gestures made by the user are recognized by the machines or Computer. Gesture recognition can be a way for computers to understand human body language, which can provide a better means of communication between humans and machines than traditional methods. This paper presents design and implementation of a hand gesture recognition system enabling human-computer interaction that uses a webcam and image processing techniques. After recognizing the hand gestures the system sends commands through serial communication to micro-controller. Micro-controller in turn, sends the appropriate commands to the vehicle through use of RF in real time. Thus, we can control the movement of the vehicle using hand gesture.

***Keywords*— Human Machine Interaction, Image Processing, Hardware Interfacing, Gesture recognition.**

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I. INTRODUCTION

In recent years, the gesture recognition has become a rising trend for several human-based electronics products. This technique lets people control these products more naturally and conveniently. Gesture recognition technique means controlling electronic product without the use of traditional methods like mouse, keyboard, etc. but through the use of gestures.This technique will also be useful for some special people, such as deaf, dumb or physically disabled people, drivers, workers, even game players. Many researches indicate that the gesture control will become the new trend of Human machine interaction (HMI).

Gesture recognition can also be used in automobiles to detect if the driver is drowsy based on his gestures and vibrate the seat to grab his attention. Gesture-recognition technology would be useful for surgeons who don't want to touch a keyboard with sterilized hands midway through surgery. Soon, gesture recognition will be an omnipresent tool in our everyday life in ways we can barely imagine

.

II. PROPOSED SYSTEM

A In this paper we will demonstrate a small vehicle being controlled using hand gestures in real time. There will be a specific gesture for a specific movement of the vehicle. After detecting and recognizing a certain hand gesture using image processing algorithms, commands will be sent through RS232 to the micro-controller. As the micro-controller doesn't support RS232 logic, MAX232 IC is used to convert the RS232 logic to TTL logic. After receiving appropriate command, the vehicle will perform the required action in real-time.

Our focus is the recognition of a fixed set of gestures, in given structured environment in real time. Therefore the speed, as well as simplicity of the algorithm is important. Furthermore, our system does not require the storage of a hand gesture in database.

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III. CHALLENGES

The main requirement for gesture interface is the tracking technology used to capture gesture inputs and process them. Gesture-only interfaces with a syntax of many gestures typically require precise pose tracking.

There are many challenges associated with the accuracy and usefulness of gesture recognition software. For image-based gesture recognition there are limitations on the equipment used and image noise. Images or video must be under consistent lighting, or in the same location. Items in the background or distinct features of the users should not make recognition difficult.
The variety of implementations for image-based gesture recognition may also cause issue for availability of the technology to general usage.
For example, an algorithm calibrated for one camera may not work for a different camera. These criteria must be considered for viability of the technology. The amount of background noise which causes tracking and recognition difficulties, especially when occlusions (partial and full) occur must be minimized.

Furthermore, the distance from the camera, and the camera's resolution and quality, this causes variations in recognition and accuracy, should be considered.

IV. SYSTEM DESIGN

A. Software

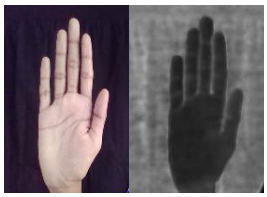
- **Capture live feed:**
  First step is to capture gestures using webcam. Captured live feed will be in RGB format.

- **Skin Tone detection:**

Fig 1. Input Image

Captured live feed may have several objects and colors in it. To get our region of interest from the feed, we need to select particular skin color. Different users may have different skin tones so we will have to update for every new user.

- **RGB to HSV conversion:**

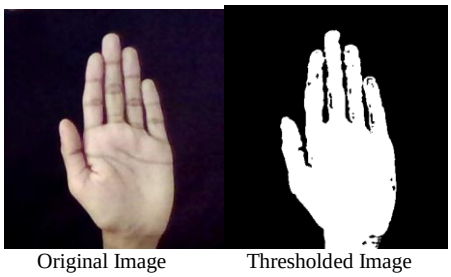


Original Image 100% Saturated Image

Fig 2. RGB to HSV

Conversion of image captured in RGB to HSV. It offers a high tolerance for matching of skin tone. By doing this, HSV thresholding based on skin tone becomes more accurate and efficient.

- **HSV Thresholding:**

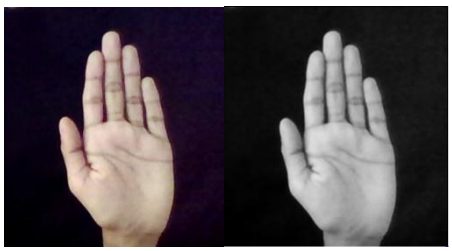


Original Image Thresholded Image

Fig 3. HSV Thresholding

Thresholding is applied on HSV image to separate the foreground (bare hand) from background and thus create a binary image i.e. an image consisting of only two colors black and white. Pixels that belongs to color intensities within threshold range are set to one everything else is set to zero resulting into binary image.

- **Blurring an image**:

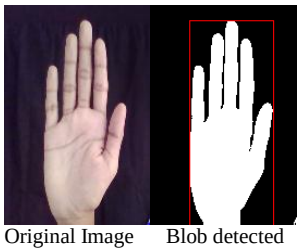


Original Image Blurred Image

Fig 4. Blurring an image

Blurring means that each pixelin the source image gets spread over and mixed intosurrounding pixels. Blurring an image reduces sharpening effect, noise and helps in more accurate detection.

- **Blob Detection:**

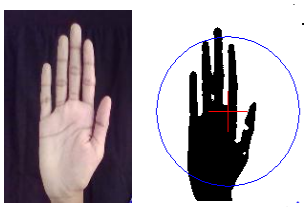


Original Image Blob detected

Fig 5. Blob Detection

It is a method to detect regions in an image and extract desired region of interest. The region which we want to select consists of bare hand from thethresholded image. In this case, after blob detection we will get an image consisting only of bare hand(gesture).

- **Center of gravity:**



Original Image Centre of Gravity

Fig 6. Blob detection

Center of gravity can be calculated using the blob of the bare hand from the thresholded image. We have calculated center of gravity (COG),$(\bar{x}, \bar{y})$as follows:

$$\bar{x} = \frac{\sum_{i=0}^{k} x_i}{k} \quad and \quad \bar{y} = \frac{\sum_{i=0}^{k} y_i}{k}$$

where x_i , y_i are x and y coordinates of the ith pixel in the hand region, and k denotes the number of pixels in the region This COG is used to calculate the vectors which will be used to recognize the gestures.

- **Vector Calculation and template matching**:

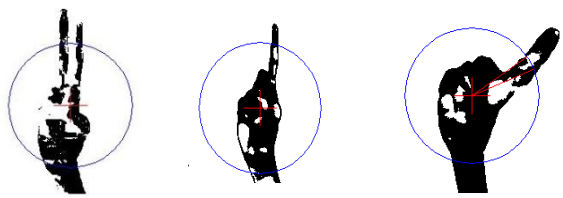


Fig 7. Vector calculation

We calculate the vectors for bare hands to recognize the gesture and detect if it is a valid gesture. If it is matched with valid predefined gesture then appropriate action will we taken.

B. *Hardware*

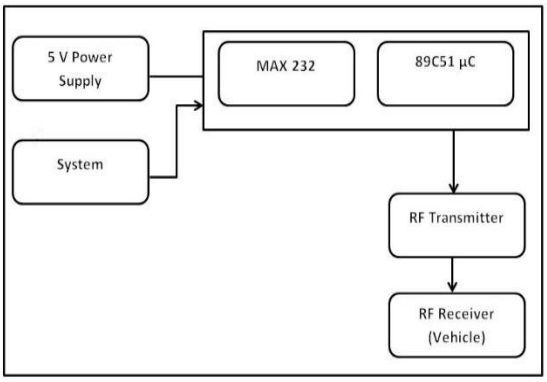
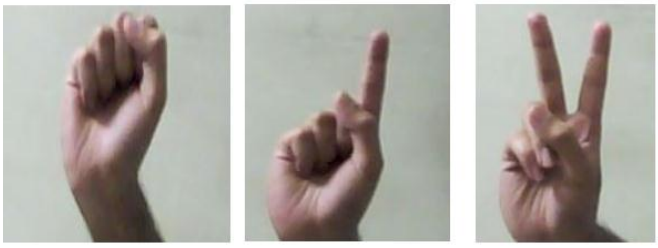


Fig 8. Hardware block Diagram

- The proposed system will contain ATMEL 89C51 IC micro-controller, MAX-232 IC interface,external power supply circuit, RS-232 serial connector, RF transmitter and a RF Vehicle.
- The power supply will consist of a 230V to 9V step-down transformer and various capacitors and a heat sink.
- As the micro-controller doesn't support serial logic, the MAX-232 interface is used to convert the RS-232 logic of the serial connector to the TTL LOGIC and for the 89C51 micro-controller.
- The appropriate commands are sent to the RF Vehicle through the RF transmitter unit.
- The micro-controller 89C51 is used to send the appropriate RF commands to the vehicle through the RF transmitter.

I. PREDEFINED GESTURES VOCABULARY



(a) (b) (c)

Fig 9. Static Hand gestures (a) Stop; (b) Move Forward; (c) Move Reverse

(a) (b)

Fig 10.Dynamic hand gestures: (a) Move Right (b) Move left

V. CONCLUSION

This system will provide a user friendly interface which would interactively receive information by hand gestures and control the movements of the vehicle. Through this system we will be able to control the vehicle using hand gestures. As future work, we can increase the number of hand gestures recognized. Also, we can mount camera on the vehicle to observe the environment. Further modifications can be that we can use several sensors to gather various data about remote location

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REFERENCES

[1] Ching-Hao Lai, Fast Gesture Recognition Scheme for Real-Time Human Machine Interaction, IEEE 2011.

[2] Jinhua Zeng, Yaoru Sun, and Fang Wang, A natural hand gesture system for intelligent human-computer interaction and medical assistance, IEEE 2012

[3] B. Ionescu, V. Suse, C. Gadea, B. Solomon, D. Ionescu, S. Islam and M. Cordea, Using a NIR Camera for Car Gesture Control, IEEE 3, MAY 2014

[4] Daniel R. Schlegel, Albert Y. C. Chen, CaimingXiong, Jeffrey A. Delmerico, Jason J. Corso, AirTouch: InteractingWith Computer Systems At A Distance,IEEE 2011

