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Real Time Gesture Recognition for Cart Movement

Vipin Garg[*1], Suramayam Tayal[2], Yogendra Singh Bora[3], Mrs. S.K. Pawar[4]
[4]Assistant Professor, [*1, 2,3]Department Of Electronics, Bharati Vidyapeeth Deemed University, College Of Engineering, Pune,Maharashtra
vipingarg3050@live.com

Abstract

Hand gesture recognition based man-machine interface is being developed vigorously in recent years. Due to the effect of lighting and complex background, most visual hand gesture recognition systems work only under restricted environment. To classify the dynamic hand gestures, we developed a simple color pointer based hand gesture system which consists of different color pointers on the finger tips which represents or points to different actions for the movement of the cart. Different colors can be used as markers on the hand or on the glove and in some research assigned one color so that to easy the process of extracting the required features.

Keywords: Gesture Recognition, Man-Machine interface, hand segmentation, Extraction.

Introduction

In recent years, computer vision based hand gestures recognition as input for man-machine interface is being developed vigorously. The most advantages of these techniques are that user can control devices without touching anything such as panel, keyboard, mouse, or remote controller. User just needs to face the camera and raise his/her hands for operation control. Hand gestures recognition systems make people having high degree of freedom and intuitive feelings. The objective of this paper is to develop a real time hand gesture recognition system based on color pointer based hand gesture system. [1]

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture, gait, proxemics, and human behaviours is also the subject of gesture recognition techniques. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant. The proposed methods employ hand gestures given by the user as input. The gestures are identified by counting the number of active fingers or the direction of the fingers and then cart is controlled. The proposed method for gesture recognition requires a database to identify a particular gesture. Image of the hand colour is created using a 2D hue saturation colour histogram. This histogram is to convert the acquired camera images into a corresponding skin colour through a process known as back propagation. Thresholding to black and white followed by morphological operations is used to obtain a single component for further processing to classify the gestures.[2][3]

Previous System

In recent years, various hand gesture recognition systems have been developed such as adaptive skin color model and motion history image (MHI). These methods were developed to reduce the effects of lightning environment, but they failed. Thus the objective of this paper is to develop a real time hand gesture recognition system with colored gloves.

By using the color gloves effect of lightning environment and camera can be greatly reduced and robustness of hand gesture can be greatly improved. The region of interest can be obtained more accurately.

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Proposed System

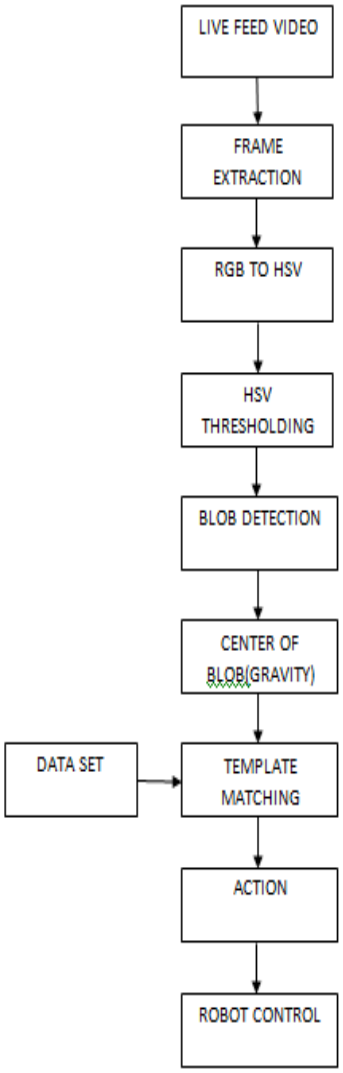

Fig. 1: Flow Model of Proposed System

RGB to HSV

The RGB color model is an additive color model in which red, green, and blue color is added together in various ways to reproduce a broad array of colors. In computing, the component values are often stored as integer numbers in the range 0 to 255. These may be represented as either decimal or hexadecimal numbers. Color images are composed of three different channels viz. Red, Green and Blue. One can also imagine three overlapped 8-bit images to compose a final 24-bit color image. In a (8-bit) gray scale image each picture element has an assigned intensity that ranges from 0 to 255. A grey scale image is different from black and white image since a gray scale image also includes shades of gray apart from pure black and pure white color. Gray scale images are usually required for image processing.

Thresholding

Thresholding is the simplest method of image segmentation. From a gray scale image, thresholding can be used to create binary images i.e. image with only black or white colors. It is usually used for feature extraction where required features of image are converted to white and everything else to black or vice-versa.

Blob Detection

In the area of computer vision, blob detection refers to visual modules that are aimed at detecting points and/or regions in the image that differ in properties like brightness or color compared to the surrounding. There are two main classes of blob detectors (i) differential methods based on derivative expressions and (ii) methods based on local extrema in the intensity landscape. With the more recent terminology used in the field, these operators can also be referred to as interest point operators, or alternatively interest region operators. There are several motivations for studying and developing blob detectors. One main reason is to provide complementary information about regions, which is not obtained from edge detectors or corner detectors. In early work in the area, blob detection was used to obtain regions of interest for further processing. These regions could signal the presence of objects or parts of objects in the image domain with application to object recognition or object tracking. In other domains, such as histogram analysis, blob descriptors can also be used for peak detection with application to segmentation. Another common use of blob descriptors is as main primitives for texture analysis and texture recognition. In more recent work, blob descriptors have found increasingly popular use as interest points for wide baseline stereo matching and to signal the presence of informative image features for appearance-based object recognition based on local image statistics. There is also the related notion of ridge detection to signal the presence of elongated objects

Center OF Blob or Interest Point

Interest point detection is a recent terminology in computer vision that refers to the detection of interest points for subsequent processing. An interest point is a point in the image which in general can be characterized as follows. It has a clear, preferably mathematically well-founded, definition. It has a well-defined position in image space. The local image structure around the interest point is rich in terms of local information contents, such that the uses of interest points simplify further processing in the vision system. It is stable under local and global

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perturbations in the image domain, including deformations as those arising from perspective transformations (sometimes reduced to affine transformations, scale changes, rotations and/or translations) as well as illumination/brightness variations, such that the interest points can be reliably computed with high degree of reproducibility. Optionally, the notion of interest point should include an attribute of scale, to make it possible to compute interest points from real-life images as well as under scale changes.

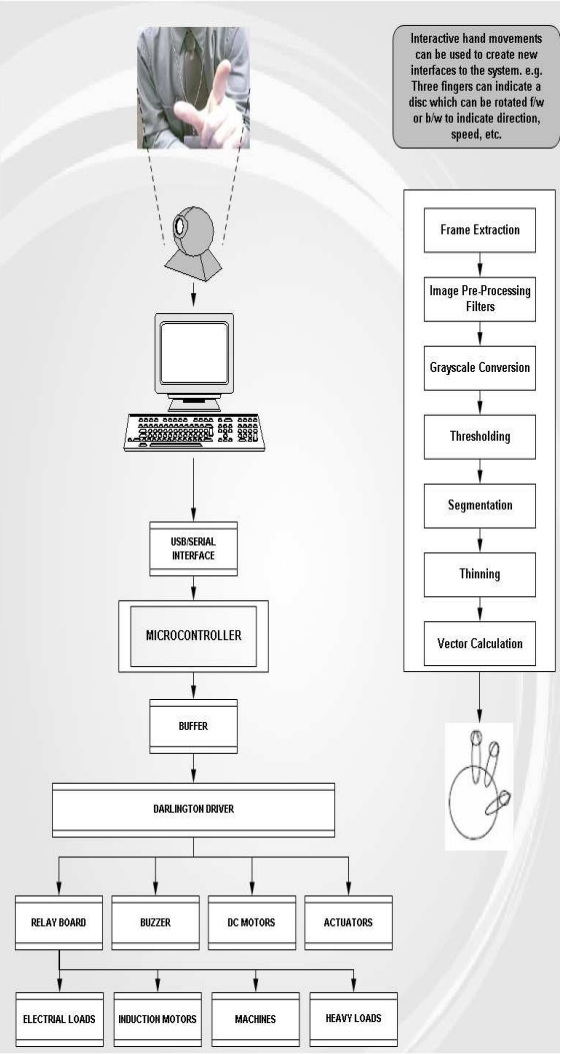

Fig. 2: Hardware Flow Model

Conclusion

The paper is focused on designing a hardware device for cart control that satisfies characteristics such as: being of small size, light weight, cheap, unobtrusive and suitable for extended and comfortable usage. The hardware is made as a "sensing glove" which recognizes certain hand gestures and responds through the group of commands that control the cart. At the same time, natural hand movements do not have influence to the control. Presented research describes the way that some gestures can be transformed into the group of computer interpreted symbols. In this research it is possible to control a cart, but in the same way a wide variety of different devices can be controlled as well. Further research would comprise implementation of a simple device which translates hand gestures into an array of alphanumeric symbols. Also, for the further phases it would be good to minimize the control interface as much as possible to enable easier integration into different wearable devices (e.g. watches, bracelets).

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