

Trajectory of Hand Gesture Capturing Device for Sign Language Recognition

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Abstract—Hand gesture is interaction between hand action and microcontroller. The gesture recognition system consist of three main modules like hand segmentation continued by hand tracking system and then by the gesture recognition from hand features. The hand gestures have not been fully explored to HCI application. It is important for achieving more gestures as the command of interface like embedded system via wireless. It detects the signal given to the controller. The limitation of the proposed trajectory recognition is that it can only recognize a letter or a number finished with a single stroke. The two main algorithms are Histogram Oriented Gradient (HOG) and Support vector machines (SVM) to recognize combination hand action. The camera is used to capturing the hand actions and then current image transfer to the microcontroller, the interface of electrical appliances is controlled by hand action.

Keywords—Trajectory recognition; hand gesture; human computer interaction (HCI).

I. INTRODUCTION

Hand gesture provides an attractive alternative to cumbersome interface devices for human-computer interaction (HCI). Gesture recognition is the process of recognizing and interpreting a stream continuous sequential gesture from the given set of input data. The large number of possible features are selected the length and the directions of trajectory. The integration of virtual content embedded into the user's real environment as realistic as possible. Commonly, interaction between user and computer application occurs by use of non-natural interaction techniques. To achieve a fully wireless technology based control the electrical appliances, the system's output (e.g. visualization) as well as system's input has to adapt to the user's reality. It focuses on the integration of a static and dynamic gesture recognition system for the use within home or industrial applications.

Usage of static gestures in our daily life to convey certain meaning leads to recognition of static hand gestures as an important aspect in HCI. Recognition systems involve various processes such as feature extraction, features reduction and classification. The main objective is to reduce the complexity with better accuracy. The use of histograms aims to deal with two problems: the chain small magnitude circular-shift problem caused by posture rotation and, to attenuate the non-linearity caused by shape differences when performing gesture postures. The hardware module consists of a microcontroller, and zigbee wireless transmission module for sensing and collecting accelerations of hand actions and hand gesture trajectories.

II. CAPTURING AND STORE THE IMAGE IN DATABASE

In this project first process is capturing the image using webcam and store the image result in data base. MATLAB software contains in-built Database tool, so we don't go for any other external tool. The program is written for storing the

images in Database and stored images are different hand gesture.

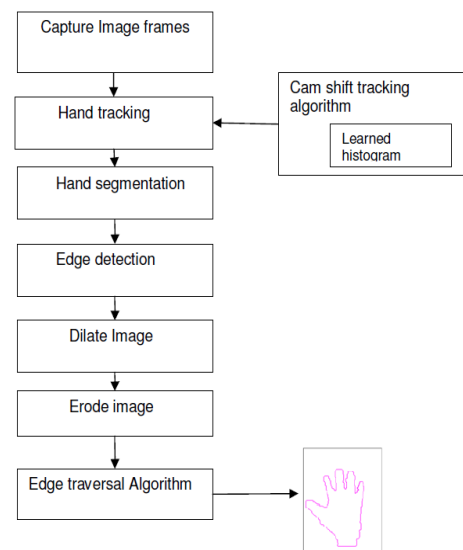


Fig. 1. Hand gesture tracking image.

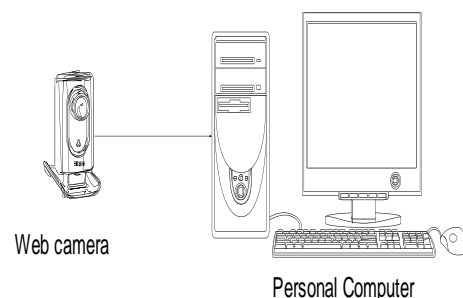


Fig. 2. Image sharing to device.

III. HAND SEGMENTATION AND EDGE DETECTION

Pre-processing methods are using a small neighborhood between pixels in an input image and it produce a new brightness value in the output image. Pre-processing

operations are also known as filtration. Local pre-processing methods are divided into smoothing and feature detection.

Smoothing is the process that is used to suppress noise which is the image equivalent to the suppression of high frequencies in the frequency domain. Feature detection, feature extraction, and matching are often combined to solve vision problems such as content-based image retrieval, face detection and recognition, and texture classification.

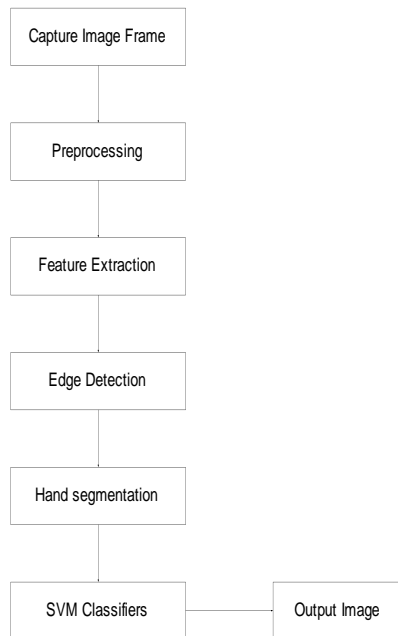


Fig. 3. Hand segmentation and edge detection.

Edge detection is used to finding the boundaries of objects among the images in an image processing technique. It works by the principle of detecting discontinuities in brightness of the image. Edge detection is important for image segmentation and data extraction in image processing, computer vision, and machine vision. Since, efficient hand tracking and segmentation is the key of success towards any gesture recognition, due to challenges of vision based methods, such as varying lighting condition, complex background and skin color detection; variation in human skin color complexion required the robust development of algorithm for natural interface. Color is very powerful descriptor for object detection. So for the segmentation purpose color information was used, which is invariant to rotation and geometric variation of the hand.

IV. IMAGE COMPARISON

IR sensor used to detect human hand is present or not. If human hand is present the information should be passed to microcontroller. Microcontroller sends the information about the IR sensor to PC. MATLAB code perform the operation depends upon microcontroller signal to capture the hand image and compare the database image. Finally PC produces the required output to the ZIGBEE via serial port. ZIGBEE is receiving the signal from transmitter section. The receiving

information given to microcontroller, microcontroller performs the specific load or device will be on/off depends upon the hand information.

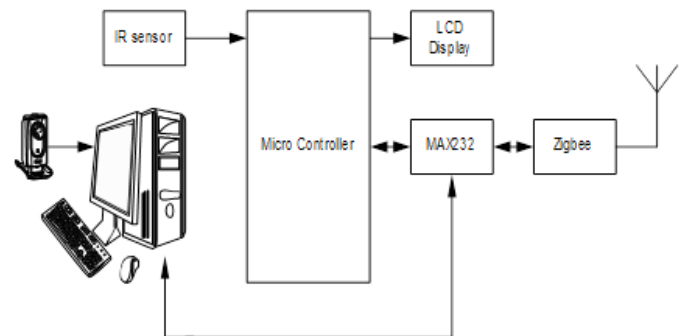


Fig. 4. Sensor hand gesture.

V. HOG

Histogram of Oriented Gradients (HOG) is feature descriptors used in computer vision and image processing for the purpose of object detection. The images are localized portion is gradient orientated. Histogram is initialized in the hand region and transferred to the tracking part. This method is parallel to the edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in the computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy. The histogram of oriented gradients algorithm was originally targeted at pedestrian detection but can be used to detect other objects.

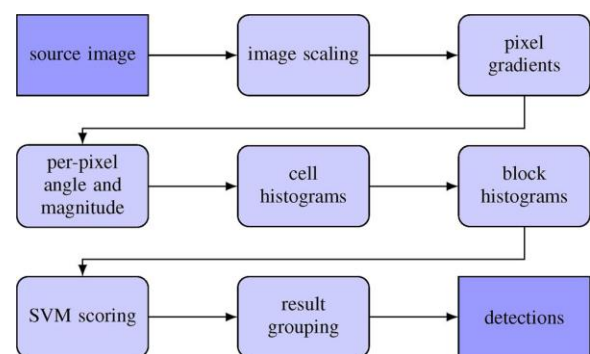


Fig. 5. HOG

The final step of object recognition is used in Histogram of Oriented Gradient descriptors are to feed the descriptors into some recognition system based on supervised learning. The histogram of oriented gradient (HOG) feature is shown the good classification of performance in hand action. However, it produces the high-dimensional features of HOG are waste the lot of computational time.

VI. SVM

Support vector machines (SVM) also support vector networks are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. SVMs can

efficiently perform a non-linear classification using implicitly of mapping their inputs into high-dimensional features. A support vector machine constructs a hyper plane or set of hyper planes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks.

It is constructed from the hyper plane, the boundaries between the input classes are discovered by SVM. These boundaries are defined by the elements of the input data are known as support vectors. The SVM decision boundary is the white line separating the regions containing them. The points which are circle are the support vectors; the result would be identical without the other points.

A support vector machine constructs a hyper plane or set of hyper planes in a high- or infinite-dimensional space. The hyper plane separates largest and the nearest training data point that belongs to any class. It also known as functional margin, since in general the larger the margin the lower the generalization error of the classifier.

VII. CONCLUSION

Hand gesture is easily recognized the hand movement by capturing device and the commands are embedded in microcontroller by using HOG and SVM algorithm. So, it easily translate the input signal to zigbee (output) and it minimize the noise level. Threshold-based classification is efficient and effective, and there are few errors when users follow our instructions on doing gestures. To identify the gestures and their functionalities, a user survey was conducted. The user survey focused on distinguishing two concepts: hand posture and hand gesture (static and dynamic). Recognition process was composed of hand posture recognition (skin

segmentation, background subtraction, region combination, feature extraction) and hand gesture recognition (tracking and recognition). The interaction application program processes these signals, translates each gesture into instructions, and then provides feedback.

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