Hand Gesture Classification Using Kaze Feature

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Abstract- *Hand Gesture Recognition (HGR) system has become essential tool for deaf-dumb people to interact with normal users via computer system. This paper proposes robust and fast system for HGR that is based on dimensionality reduction of KAZE feature besides reducing computational cost and memory requirements. Multi-class Support Vector Machine (SVM) and k-Nearest Neighbours (KNN) classifiers are used to classify the hand gestures. The proposed algorithm achieves average recognition rate of 95% under different hand poses and complex background with changes in lightning. Our proposed algorithm reduces gesture matching computational cost and memory requirements by 98.6%. Experimental results show that average accuracy with KNN classifier is better than with SVM classifier. The results also show that our descriptor is robust against multiple variations such as rotation, scale, translation, and lighting while provides good performance.*

Keywords- Hand Gesture Recognition, Image Processing, KNN Classification, Kaze Feature

I. INTRODUCTION

With the massive influx and advancement of technologies, a computer system has become a very powerful machine which has been designed to make the human beings' tasks easier. Due to which the HCI (human – computer interaction) has become an important part of our lives. Now-a-days, the progress and development in interaction with computing devices has increased so fast that as a human being even we could not remained left with the effect of this and it has become our primary thing. The technologies has so much surrounded us and has made a place in our lives that we use it to communicate, shop, work and even entertain ourselves1. There are many applications like media player, MS-office, Windows picture manager etc. which require natural and intuitive interface. Now-a-days most of the users use keyboard, mouse, pen, Joysticks etc. to interact with computers, which are not enough for them. In the near future, these existing technologies which are available for the computing, communication and display will become a bottleneck and the advancement in these technologies will be required to make the system as natural as possible. Nevertheless the invention of mouse and keyboards by the researchers and engineers has been a great progress, there are still some situations where interaction with computer with the help of keyboard and mouse will not be enough This is the case with the advancement in hand held devices like mobiles or i-pods or Tabs which are relatively very small in size. It's very difficult to interact with them due to their determined input spaces and small touch screen or keyboard. This is also the case of interacting 3D objects where these devices are incompatible for HCI. One long-term goal in HCI has been to migrate "natural" means that human used it to interact with each other. With this goal human speech recognition was the area of research for a decade. It has made a tremendous progress in its field. However from the recent years there has been an increased extent in trying to introduce other human-to-human communication modalities in HCI. So human hand gestures can provide a natural and visceral alternative to some incompatible devices. We can use hand as a device to interact and communicate with computers as we do in our daily lives to interact with each other. We use our hand to point a person or an object, express or carry information about something, and to move, modify and transform an object. Exactly the same way we can use our hand to gesticulate while speaking to convey ideas. It is required to provide a way to explore the use of gestures in HCI so that it can be interpreted by computers. The static and/or dynamic form of gestures of human arm, hand and even some other body parts require to be measurable by machine for the HCI interpretation. To facilitate and accomplish the advanced interaction between humans and computers, the designing of some special input devices has been found to be of great care in this area. The aggregation of traditional devices (i.e. keyboard, mouse etc.) with the new designed interaction devices such as face and gesture recognition, haptic sensors2, and tracking devices provides flexibility in Virtual Reality (VR)3, cars system control4, Tele-operating5, robot control6, text editing5, gesture recognition, video games5, and multimedia interfaces5. The motivation behind this research is to make an interaction between human and computer using various applications running on computer by aiming basic shapes made by hand. Our hand movements have an important role while interacting with other people, as they convey very rich information in many ways. According to this thought hand gestures would be an ideal option for expressing the feelings, or controlling the dynamic applications of computers through

easier hand gesture. In compare to other body parts, human hand which has been considered as a natural means for human to human interaction, has been used widely for gesturing and can be best suitable for communication between human and computer1. There are several typical applications of hand gesture recognitions such as virtual game controller7, sign language recognition8, Directional indication through pointing, making young children to interact with computer, human computer interaction8, robot control8, lie detection8 etc. The increasing interest in this field has made the researchers to do a large number of research which has been endured in a number of surveys given in1. These surveys are directly or indirectly related with hand gesture recognition.

II. LITERATURE REVIEW

1. Gesture Signals Processing for a Silent Spybot. N. SaiChinmayi, Ch. Hasitha, B. Sravya and V. K. Mittal (2015).

This paper proposes the prototype of a silent Spybot is developed that operates by processing the gesture command signals. The prototype uses video processing with object tracking algorithm to understand the gesture commands. The Spybot is programmed to interpret the gesture command signal and navigate according to hand gestures, sensed by a video camera operating within a short range. The gesture commands can be used for controlling the spybot's functions such as movement of the robot. As a possible application, a spy robot that captures images from target places silently and sends the spied data to a host computer.

2. Hand gesture recognition system for real-time application Murugeswari. M, Veluchamy.S. (2014).

This paper presents a vision based hand gesture recognition system to control the movement of robot. We can use of Scale invariant feature transform (SIFT) for extract the key point from the gesture image capture by single sensing device. Space incompatibility of SIFT key point causes bag of feature approach was introduced. Then use the vector quantization will map the key point extracted from SIFT into unified dimensional histogram vector after the K-mean clustering. The histogram vectors as an input to multiclass SVM classifier for recognize the gesture. Generate the grammar apply to the robot to control the movements (Left, Right, Straight ward, Backward, stop) of robot..

3. MATLAB based image editing and colour detection Raquib Buksh, Soumyajit Routh, Parthib Mitra, Subhajit Banik (2014)

This paper proposes the implementation of various MATLAB functions present in image processing toolbox of MATLAB and using the same to create a basic image processor having different features like, viewing the red, green and blue components of a colour image separately, colour detection and various other features (noise addition and removal, edge detection, cropping, resizing, rotation, histogram adjust, brightness control, etc.) that is used in a basic image editor along with object detection and tracking.

4. Real Time Gesture Recognition System for Interaction in Dynamic Environment Siddharth S. Rautaraya, Anupam Agrawala (2012)

This paper designs a system for gestural interaction between a user and a computer in dynamic environment. The gesture recognition system uses image processing techniques for detection, segmentation, tracking and recognition of hand gestures for converting it to a meaningful command. The interface being proposed here can be substantially applied towards different applications like image browser, games etc.

5. An Integrated Colour and Hand Gesture Recognition Approach for an Autonomous Mobile Robot Kuan-Yu Chen, Cheng-Chin Chien, Wen-Lung Chang, Jyh-Tong Teng(2010)

This paper presents the development of a real-time human-robot interaction with hand gesture recognition which can be constructed combining colour and shape cues. A colour multithresholding method with thresholds self-tuning mechanism to overcome the variation of target colour suitable for indoor and outdoor environments. The feature of the hand gesture is determined through the boundary extraction algorithm and the Fourier descriptors without having the results being affected by the rotation or size of hand gestures. The accuracy of hand gesture recognition for the robot vision system has been enhanced.

III. EXISTING SYSTEM

This paper proposes robust and fast system for HGR that is based on dimensionality reduction of KAZE feature besides reducing computational cost and memory requirements. Multi-class Support Vector Machine (SVM) and k-Nearest Neighbors (KNN) classifiers are used to classify the hand gestures. Support Vector Machine (SVM) is a relatively simple Supervised Machine Learning Algorithm used for classification and regression. KAZE Features is a novel 2D feature detection and description method that operates completely in a nonlinear scale space.

EXISTING TECHNIQUE : Machine Learning

IV. PROPOSED CONCEPT

Here in this project, the proposed system is the use of Matlab instead of Machine Learning concept.

PROPOSED ALGORITHM: KAZE, KNN
ALGORITHM DEFINITION:

KAZE Features is a novel 2D feature detection and description method that operates completely in a nonlinear scale space. Previous methods such as SIFT or SURF find features in the Gaussian scale space (particular instance of linear diffusion).

KNN Classification is the binary (as two class) is given more accurate data classification which beneficial to select k as an odd number which avoids the irregular data. The KNN procedure is the technique in ML procedures: It is an object which classified through a mainstream selection of its neighbors, with the determination assigned occurrence for most mutual class amongst its k nearest neighbors (k is a positive integer, classically small). Classically Euclidean distance is used as the distance metric; however, this is only suitable for endless variables. In such situation as the classification of text, alternative metric, intersection metric or Hamming distance can be used. KNN is a new process that deliveries all available cases and categorizes novel cases built on an evaluation quantity (e.g., distance functions). KNN procedure is identical simple. It works built on a minimum distance from the interrogation instance to the training samples to regulate the K-nearest neighbors. The information for KNN procedure contains numerous attribute which will be used to categorize. The information of KNN can be any dimension scale from insignificant, to measurable scale.

ARCHITECTURE DIAGRAM

The Architectural Diagram represent the flow of the project, it consists of all the modules and how the project works in a a detailed manner.

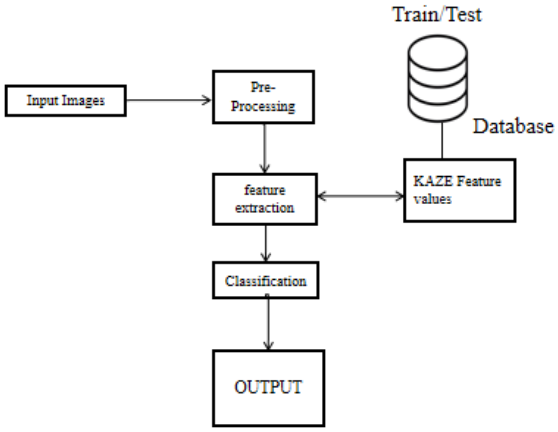

FIGURE 4.1 ARCHITECTURE DIAGRAM

ADVANTAGES:

- It is more accuracy than other machine learning algorithms.
- Using of different color spaces we have to choose the best color channel.
- Using of various feature extraction methods we have to identify the appropriate differences between different types of leaf diseases.

V. MODULE DESCRIPTION

1. INPUT IMAGE:

Read and Display an input Image. Read an image into the workspace, using the I'm read command or by using CAMERA. In image processing, it is defined as the action of retrieving an image from some source, usually a hardware-based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed.

2. PREPROCESSING:

Pre-processing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images. The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing. Image pre-processing methods use the considerable redundancy in images. Neighboring pixels corresponding to one object in real images have essentially the same or similar brightness value. Thus distorted pixel can often be restored as an average value of neighboring pixels.

3. FEATURE EXTRACTION:

In pattern recognition and in image processing, feature extractionis a special form of dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant, then the input data will be transformed into a reduced representation set of features. Transforming the input data into the set of features is called feature extraction. If the features extracted are carefully chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input. Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power or a classification algorithm which over fits the training sample and generalizes poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problems while still describing the data with sufficient accuracy.

4. CLASSIFICATION:

In this module the image is classified based on the KNN algorithm and then expected output is generated.

VI. RESULT

Here, the input of the hand gesture gets captured and classified to get the result.

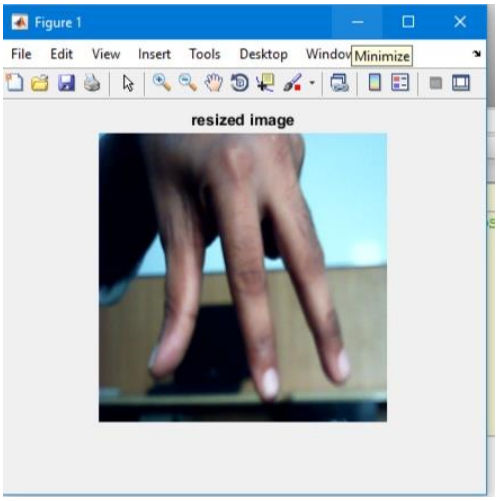

Figure 6.1 Input captured

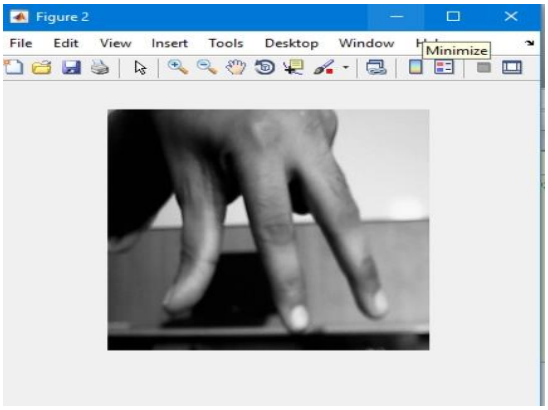

Figure 6.2 Process

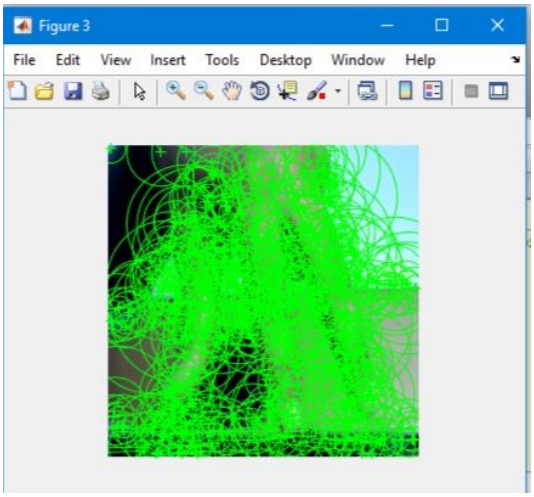

Figure 6.3 Classification Analysis

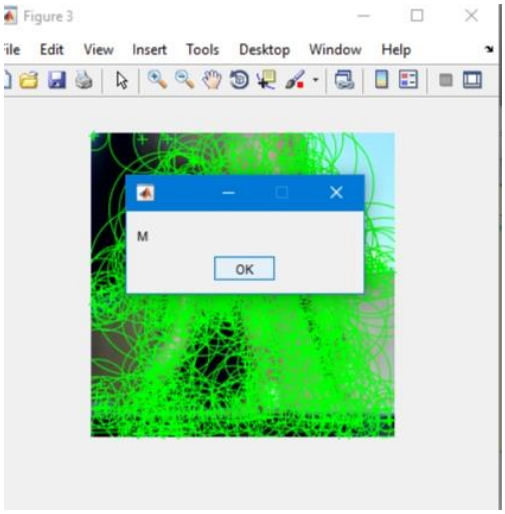

Figure 6.4 Result generated

VII. CONCLUSION

This paper proposes an innovative way of monitoring physically challenged people based on image processing matlab and apr voice module. As an advancement in technology, gesture based interaction has proven to have a

future of interaction of the physically challenged peoples. The proposed device gives users a new experience.

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