Survey: Various Techniques to Detect and Classify Hand Oriented Gesture in Digital Image Processing

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Abstract— Hand Sign Recognition is the usual way of Human Machine communication and today many researchers are working on various applications to make connections more easy, natural and convenient without wearing any extra device. The central aim of hand gesture appreciation is to identify the gestures and classify them accurately in order to interact with the environment in the most convenient and efficient way. In this paper we are focussing on the work completed in the area of hand gesture recognition based on the intellectual approaches counting soft computing based methods, neural network, uncertain logic, genetic algorithm etc. This survey paper suggests a real time application and novel approaches for a hand-pose approximation that can be used for vision-based human interfaces. Finally the evaluation of various methods is also presented.

Key words: Hand Gesture Recognition, Human Machine Interaction, Intelligence Approaches and Artificial Neural Network

I. INTRODUCTION

Gesture appreciation is a significant [1] task. Gestures form the non-verbal means of communication so as to take meaningful information to the recipient and to interact with the environment. It is vital since it is a versatile and natural way to progress new, more natural forms of human machine interface. At the similar time, it is demanding because it involves the solution of many valuable subtasks such as robust documentation of hands and other body parts like gesture modelling, tracking, pattern appreciation organization [2]. Gestures can be considered based on four aspects:

- Shape,
- Motion,
- Position and
- Orientation

Hand gesture appreciation is used in human processer boundary to create user borders that are conventional to use and easy to study [4, 5, 6].Sensors which have been used for hand gesture recognition include wearable instruments such as data jumbles and exterior devices such as video cameras. Data gloves can offer accurate dimensions of hand pose and undertaking, but they lack naturalness, and are often very exclusive. For the proper implementation of the organization to yield good results, it is a must that their performance is known. Hand gesture recognition tasks have issues in terms of noise factors, lighting conditions, background complexities, rotation and scalability problems and certain methods have been used to overcome complexities , however many remaining unsolved. Artificial neural system is regarded as the best classifier for classification of gestures. Hand gestures work comprises of three main paces staring with capturing or acquisition of image, subdivision of the acquired image followed by classification. Suitable algorithms and classifiers are used for resonant out each task. In this paper an approach for man machine contact using a video camera to appreciate the American number gestures is overviewed.

II. HAND DETECTION APPROACHES

A. Appearance Based Approaches:

Fingertip discovery has been used by most researchers to transport out the detection for hand image construction. A focus on various 3D hand stances in a system called GREFIT was considered [6]. In this work were suggested few methods to locate fingertip in hand.

- Mark fingertips colour and construct histogram.
- Use different pictures of a prototype.

An attempt to recognise gestures in a dark room using white florescent paper was also conducted but was cumbersome for users and was a bit impractical.

B. Model Based Approaches:

The work has been carried out by using histogram for calculating the likelihood for skin color remark. A model like Gaussian distribution is taken for background pixels marking, followed by subtracting the new image pixels in order to get the gesture of the image [7]. Also for observing human activities, Genetic Algorithm is used in a chromosome pool denoting Pc0and Pm0 as crossover and mutation rate respectively which were calculated using various static features. Crossover led to new chromosome formation and mutation being responsible for introducing new genes into chromosomes. Using the same approach, YCbCr skin color was used to detect the region of hand. Distance transform was also applied.

Fig. 1: Sign Languages

C. Soft Computing Approaches:

Apart from other approaches, soft computing methods try to bring out valuable detection of gestures in an efficient manner. This approach works on how to get the better output. Under these techniques fall: Neural Networks, Fuzzy Systems, Machine Learning, Evolutionary Computation, Genetic Algorithmetc and their hybrid approaches.

III. RELATED WORK

Kapil Yadavet et.al, 2016[15] Presented a paper on gesture based system to border Microsoft Word document. The process was carried out using a two state discrete time-based model for signs which works with separate poses. Siddharth S. Rautarayet.al,2015[9]described the work in terms of

technologies available for recognition, the application domains, platforms supported, comparative analysis and future perspectives of gesture recognition techniques that may be used for efficient human computer interface. The central goal of this review is to provide academics in the field of gesture based Human Computer Interaction with immediate development attained to date and to help recognize areas where additional investigation is wanted. Ram et.al, 2015[14] described the positive impact of hand gesture recognition for human processer interface in our societies. Either it was the day when the machineries had not been so advanced or the current era when the machineries are very much advanced so much that we spent most of our times to connect, play, do our jobs with the machines and many more, even then human beings are still using an extensive range of signals to communicate or interrelate with each other. Chih-Hung Wu et.al, 2015[13] planned a system consisting of three main mechanisms namely pre-processing, static carriage recognition and dynamic gesture recognition to sense and track the hand. In the first constituent, subtraction is used to reject invalid gestures which are not produced by the main user. Hamid A. Jalab et.al, 2015[10] this paper presented an algorithm on hand gestures for regulatory media player using neural network. The planned algorithm distinguishes a customary of four detailed hand gestures, namely: Play, stop, forward and reverse. J.P.Justinaet et.al, 2014[12] The work provided a chance for the physically disabled people so as to express themselves with normal people those who do not know the sign languages. It is a natural and effective way to provide the interaction between human and the computer. Hand sub division is the most significant step in every hand gesture recognition system for quality output since if we get better segmented output, better appreciation rates can be realized. Yimin Zhou et.al, 2014[11] In this paper, a great level hand feature extraction method is planned by the aid of finger parallel edge article and angular forecast. The finger is demonstrated as a tubular object and the finger images can be achieved from the difficulty with an exact operator as salient hand edge images.NguyenKim-Teinet.al, 2013[6] Proposed a method for controlling wheel chair using hand gesture recognition. This work aimed at curving of hand shapes delineation.

IV. HOW TO RECOGNIZE THE HAND GESTURE?

There are numerous methods to notice the hand gestures. The covering color detection is one of the most widespread methods. This method is unpretentious and be contingent on skin color that can be white, black, or other colors, and the situation light conditions, as well as the background.

Fig. 2: Convex Hull enclosing the Hand area

Another method doesn't use the shade of hand; instead it uses the convexity discovery or convex hull. These two approaches are the most general and the simplest ways to perceive and identify the gestures.

V. WHY TO CREATE THE GESTURE SYSTEM?

During application one thing was certain that a organization is going to be developed which can capture a hand signal performed by the user in opposite of web Cam [5], this captured duplicate is then analysed to recognise the valid and gesture finished specific algorithm and execute the corresponding operation. The gesture should be continuous for some period of time, which is needed for dynamic processing. These signals should be previously defined as valid gesture for processing. Moreover these systems act as a counterpart to keyboard and mouse thereby lessens the burden of using such devices. The creation of these systems motivates users to explore what they need and assistances those to achieve the goal with ease.

VI. ADVANTAGES OF HAND GESTURE RECOGNITION

One of the main advantages of hand gesture recognition is its naturalness in communicating with the environment by directly using hands without making use of input devices such as mouse or keyboard which is helpful to those who lack the typing skills or have poor technical skills. These systems serve a lot of purposes for deaf and dumb people who face difficulties in expressing themselves. Moreover it does not tell upon ones health caused by continual use of keyboard or mouse. If the performance of this work remains good a disease associated with it namely Parkinson's disease will find its cure. The exact shape of the hand obtained led to good feature extraction. Fast and powerful results were obtained from the proposed algorithm. These systems tend to be simple, active, cost effective and successfully can recognize a word and an alphabet. Automatic sampling and augmented filtering data improved the system performance. The system successfully recognized static and dynamic gestures. It can be applied on a mobile robot control and in lie detection systems. Despite being natural, this system is easy to implement. No Training is required.

VII. CONCLUSION

Various requests of hand gesture appreciation have been implemented in different domains from basically game inputs to critical applications. Hand gesture appreciation is the natural means to interrelate with vision empowered computers and other machines. This paper primarily focused on the learning of work done in the area of normal hand gesture appreciation using Computer Vision Techniques. We did survey founded on intelligent methods mainly in the context of soft calculating methods using Artificial Neural Network, Fuzzy Logic, Genetic Algorithm and other well performed intelligent techniques have been deliberated and compared. In appearance based approach, main focus was on sensitive detection as it was used by most of the researchers. Also in this approach, work was carried in which segmentation of the image was not done rather image would act as a feature itself. This was further supported by making combinations of features like Principal module analysis hand position, hand velocity etc. Soft computing approaches provide a way to outline things which are not sure [10] but with a calculation that can be made sure using education models and training data. So soft computing is very actual in receiving the results of the images where the exact positions of hand or members are not possible.

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