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Comparison between Artificial Neural Network with Support Vector Machine of Hand Gesture Recognition

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Abstract **-** Hand Gesture recognition systems have been considered as the able-bodied and well-made systems with the goal of interpreting gestures, making use of suitable algorithms to accomplish the recognition task. So far, various techniques were used to identify the gestures; many have their own advantages but also have few shortcomings like responsiveness, classification, accuracy etc. An original hand biometric verification technique base under capacities of the user's inactive fist action of pass symbol phonological is planned. The dimension of grasp indication might be consecutively developed by a cut-price videotape camcorder. Convenient keep perchance exist one more stage of background info, linked among these grip hint to be worn in biometric confirmation. Our proposed work focuses on extracting the features using Principle Component Analysis (PCA) algorithm, optimizing those features using Genetic Algorithm and finally classifying the gestures using Support Vector Machine (SVM). By doing this our system obtains better performance in terms of classification and faster response time or delayed outputs and achieved the FAR=0.0001649, FRR=1.754 and Accuracy value is 98.67.

Keywords **-** Hand Gesture recognition System, Support Vector machine and Biometric Authentication.

I. INTRODUCTION

Sign recognition is a significant, yet problematic assignment. It is vital since it is a multipurpose and natural method to progress new, more normal and worldlier centred forms of human mechanism interface. At the similar time, it is demanding since it includes the explanation of many inspirational subtasks, such as vigorous documentation of hands and other figure parts, gesture showing, tracking, pattern appreciation and organization [2]. Consequently, all sign recognition methods try to method the problematic by absorbed on one or more of the overhead four features.

- *Position based methods:* For illustration, operate stationary images, absorbed only on the figure of the hand to selection assemblies such as hand outlines, fingertips and finger guidelines.
- *Sequential approaches:* On the other arrow, not only make use of three-dimensional structures but also exploration sequential material such as the path surveyed by the hand, its rapidity, etc. Moreover, there is strong neuron biological indication which signposts that on-going arrangements are unwritten by the human pictorial system into orders of motor primitives. Based on this suggestion, various gesture recognition approaches, mostly within the engineering community, model and categorise gestures giving to the developed motorized primitives [3].
- Gesture recognition can be term as an advance in this direction. It is the procedure by which the signals made by the user are standard by the recipient. Gestures are significant, important body motions involving bodily movements of the fingers, hands, arms, head, face, or body with the aim of:

a) Conveying important information or
b) Interacting with the environment [9].

Hand sign recognition is recycled in human automaton interface to produce user boundaries that are regular to use and easy to study. Instruments used for hand gesture gratitude include wearable instruments such as data castoffs and exterior instruments such as video cameras. Data handbags can offer precise dimensions [6] of hand pose and task, but they require widespread calibration, limit natural hand undertaking, and are often very exclusive. One of the major goals of Hand Gesture [10] Recognition is to recognize hand gestures and categorize them as correctly as possible. For system to be productively implemented, it is serious that their performance is known. To date the presentation of most algorithms has only been report on identification tasks, which involve that description on detection tasks holds for confirmation.

Hand gestures are the independent way of communication. Hand gestures can be careful as opposite modality to speech. Gestures are knowingly and insentience used in every aspect of human communication and they form the basis of symbol languages [7].

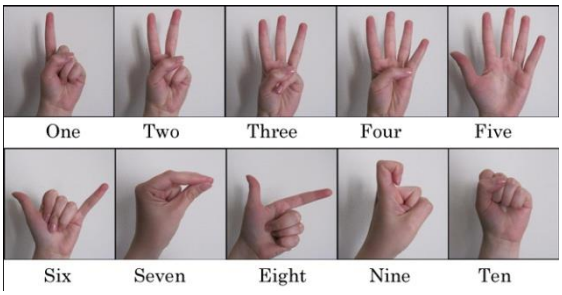

Fig.1: Hand Gesture Recognition

II. APPLICATIONS IN HAND GESTURE

Hand gestures recognition system has been practical for unlike applications on different field, as declare in counting;

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symbol language conversion, virtual environments, smart examination, robot control, medical systems etc. Impression of some hand [11] gesture application areas are scheduled below.[7]

a) Sign Language Recognition: Since the sign language is used for interpret and clarification of a certain subject during the chat, it has received special attention. A lot of systems have been future to recognize gestures using different types of sign languages.
b) Robot Control: Scheming the robot using gestures considered as one of the attractive applications in this field. Proposed a system that uses the number to count the five fingers for regulatory a robot using hand pose signs. The orders are given to the robot to carry out an exacting task, where each sign has a precise meaning and represents dissimilar purpose for illustration, "1" means "shift forward", "5" means "stop", and so on
c) Graphic Editor Control: Graphic editor control system requires the hand gesture to be track and situated as a pre-processing operation. Used 12 dynamic gestures for drawing and suppression graphic system. Shapes for picture are; triangle,[12]quadrilateral, circle, arc, straight and upright line for picture, and commands for editing realistic system are; photocopy, remove, change, exchange, undo, and nearby .
d) Virtual Environments: One of the accepted applications in gesture acknowledgement system is virtual environments VEs, especially for announcement media systems.[8]

III. RELATED WORK

Nasser H et.al,2011[1]presented a real time system, which comprises sensing and following simple hand in jumbled related using covering detection and indicator positions contours contrast algorithm after face deduction, and knowing hand gestures using Principle Components Analysis .

- In the exercise stage, a set of hand carriages images with different scales, revolution and lighting situations are trained. Then, the most eigenvectors of exercise images are determined, and the training weights are planned by projecting each training picture onto the mainly eigenvectors.
- In the challenging phase, for each surround taken from a webcam, the hand gesture is perceive by means of our method, then the unimportant picture that comprises the detected hand gesture is predictable onto the mainly eigenvectors of training picture to form its check weights. Lastly, the lowest Euclidean distance is resolute between the test masses and the training hefts of each training image to identify the hand gesture.

Bhavsar et.al, 2011[2] explained a well-organized human real computer interface is assuming greatest position in our regular lives. Human actualities can connect primarily by dream and comprehensive. Human can identify the evocative languages of motion using hand gesture. Hand Gesticulation is the most significant to conversation ideas, mails, opinions etc. among deafened and dumb people. This paper converses a simple acknowledgement procedure that distinguishes the statistics from 0 to 10 using thresholding.

Luigi Lambert et.al, 2011[3] this paper offerings an actual time hand gesture recognizer based on a colour glove. The recognizer is designed by three components:

- The main part, fed by the surround assimilated by a webcam, recognises the indicator image in the extract.
- The additional component, article extractor, characterizes the image by a nine-dimensional article vector.
- The third element, the classifier, is realized by resources of Culture Course Quantization. The recognizer, tested on a dataset of 907 hand signals, has shown very high gratitude rate.

K. Sivarajesh Reddy et.al ,2011[4]presented by, Hand gestures are an ultimate way of replacing information between human and computer, automatons, or any other device. In this paper they are scheming skeleton of the hand by using reserve transformation performance and are using for recognition in its place of the entire hand, because of its robust nature against conversion, rotation and scaling. Minimum is computed for each and every hand carriage in the entire hand gesture and covered on a single image called as Lively Signature of the specific gesture type. Gesture is familiar by using the Image Euclidean distance amount by linking the current Vigorous Signature of the specific gesture with the gesture Script set.

Jesus Suarez et.al,2012[5]This papers described that custom the Kinect and the Opening collections for hand following incline to attention more on submissions than on localization and organisation approaches, and demonstration that the Initial hand pursuing way is respectable sufficient for the requests tested thus far. Though, the boundaries of the Kinect and other penetration sensors for signal acknowledgement have yet to be verified in interesting requests and surroundings.

Nguyen Kim-Tien et.al, 2013[6] in this paper presented by, an method for supervisory wheelchair crusade using hand gesticulation recognition. This technique was advanced created on the crooked hand shapes allocation. It is humble and has selected structures to diagnose and offers strength distinguishing gesticulations of one hand. The crooked based hand gesture appreciation algorithms discriminates hand gestures using a grouping of hand shape contour geometry and calculating the distance from the centre of pointer to the curved exterior on the fingertips.

IV. OBJECTIVES

Thesis encompasses a set of objectives that is connected with a set of objectives that is associated with target of this process. The objectives are mentioned below.

a) To create a data set.
b) Design and implement the robotic control technique for hand gesture recognition.

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c) To analyze the performance of the proposed technique and compare with existing technique based on various parameters.

V. STATE OF ART

In this research work, Hand gesture recognition is divided in four phases:

- Image Acquisition and Pre-Processing

A structure from the webcam is arrested .Pre-processing surprises with sound decrease using middle strainer to eliminate blares. After, appearance has been collected towards erase the undesirable shares about effective unique descriptions. Lastly affecting consequence model are pure by unbroken amount also related. Afterward so, every collected indicator imagery were resized addicted to, minor volume than the unique dimension whatever is essential to recover concert inside conditions like speediness.

- Analysis

Illustration separation is the chief phase as whichever copy gratitude procedure finished that the enter photograph is divided into dissimilar expressive substances through deference near convinced feature. The key objective of indicator separation is too different the customer gives starting the related in the double. Here can be attained via dissimilar reflection subdivision procedure.

The subdivision procedure should able to create appropriate image to hand gesture appreciation.

- Feature Extraction

We can use this algorithm to compute and study the Eigenvectors of the dissimilar pictures and then to direct each image with its principal components or Eigenvectors.

- Optimization Techniques

Genes procedure is a system for stirring from 1 population of genetic material" (e.g., clothes of \bits" on behalf of candidate solutions to a problematic) to a new populace, using collection" collected with the heredity stimulated workers of border, alteration, and transposal. Each RNA consists of genetic factor" (e.g., bits), with each gene existence an example of a precise ".

- Classification using Support Vector Machine

Support Vector Machine also called Support Vector Networks are oversaw learning models that examine data and recognize patterns. SVM models symbolize examples as point in space mapped in approach that separate category examples are divided by a gap thereby performing linear arrangement. Apart from this SVMs can also achieve non-linear classification using Kernel trick.

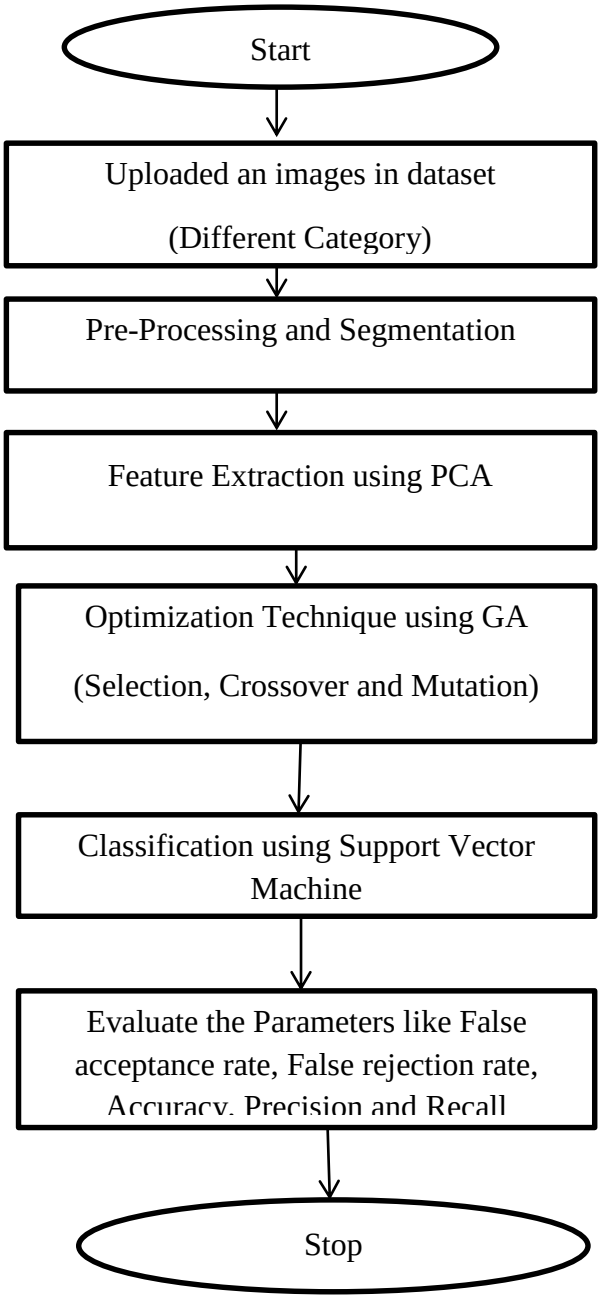

Fig.2: Purposed Work Flow Chart

VI. RESULT ANALYSIS

We are using simulation tool in MTALAB and platform used Graphical User Interface. The Following Development Tools has been used in the development of this work. There mayalsobeothertoolswhichcanbeusedinthisdevelopmentasitb econtingentpersonto person and his interest. Therefore the used tools are

- Minimum of 3 GB of RAM
- Processor-Pentium 3 or extended versions
- MATLABR2010a

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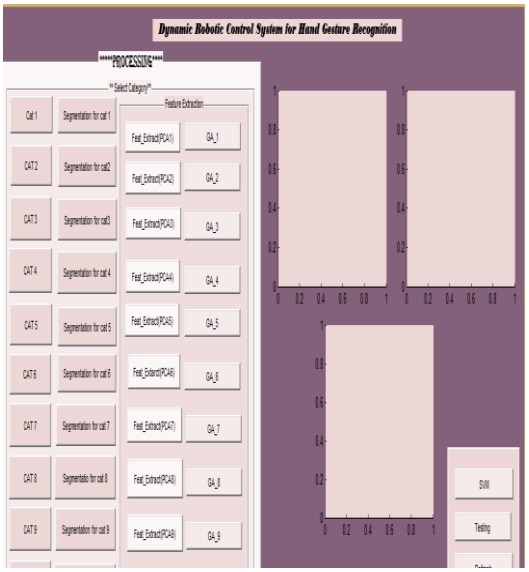

Fig.3: Central_page.fig

Above figure shows that define the 10 categories, perform the segmentation in 10 categories, feature extraction defines the unique properties and applies the optimization technique using genetic algorithm.

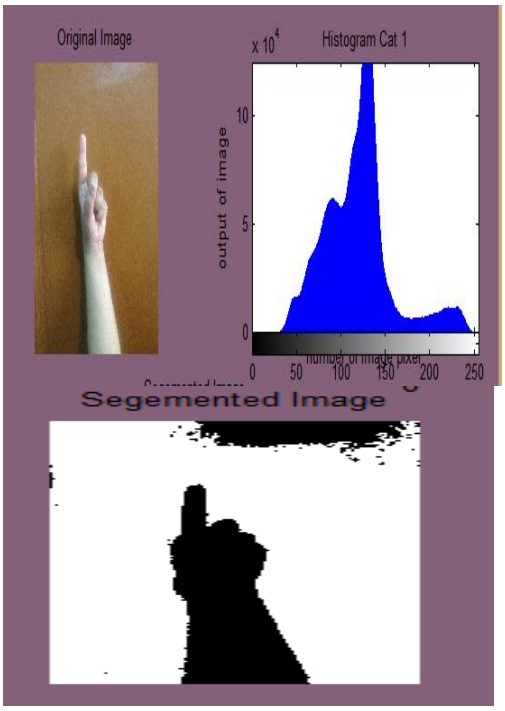

Fig.4: Original Image, histogram and Segmentation

Figure shows that the original image and create the histogram in cat1 to cat 10.The segmentation means filter the image using morphological technique. The feature extraction using Principle Component Analysis means find the unique properties.

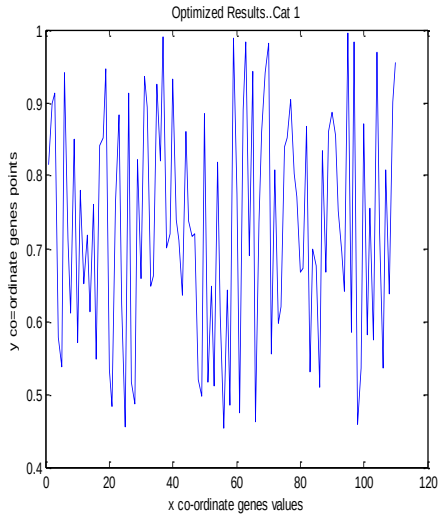

Fig.4.5: Optimization Techniques using GA

Figure shows that, apply the genetic algorithm means reduce the category in hand gesture recognition. Apply the classification using support vector machine means kernel divide the groups in two parts (1,0).

Table no: 1 Comparison between Proposed Work and Existing Work

Category No.	Accuracy Proposed Work	Accuracy Exiting Work	Mean Square Error Rate Proposed Work	Mean Square Error Rate Existing Work
Cat 1	97.89	89..23	0.0001649	1.754
Cat 2	98.67	87.23	0.000227	5.54
Cat 3	96.78	87.56	0.0005163	6.982
Cat 4	96.89	86.09	0.0006712	0.000234

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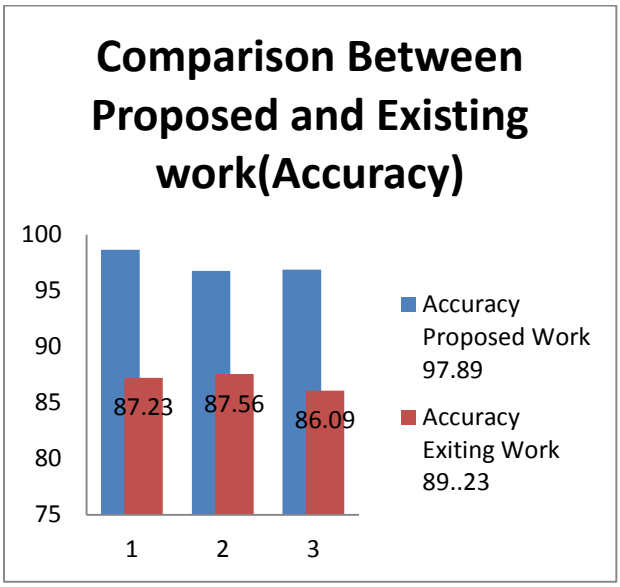

Fig.6: Comparison between Proposed Work and Existing work (Accuracy)

Accurateness is how secure a calculated value is to the authentic (true) charge. Above figure shows the accuracy value for proposed method and it has been clearly seen that accuracy for proposed method is good as compare to existing work. We achieved the Proposed work value accuracy is 97.89 and Existing work accuracy value is 89.23.

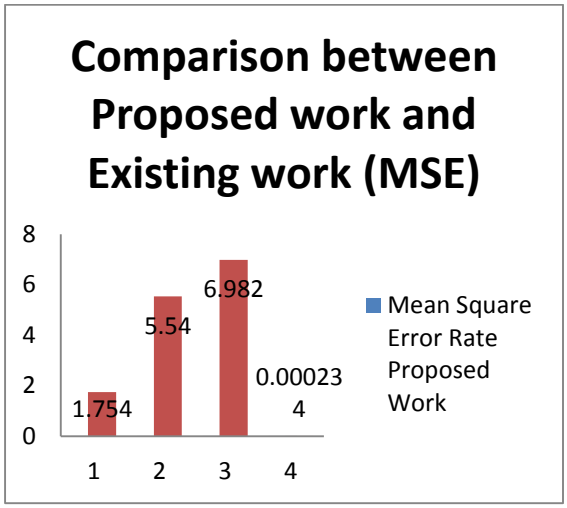

Fig.7 Comparison between Proposed Work and Existing work (Accuracy)

Figure Shows defines that the mean square error of an estimator events the average of the squares of the errors or deviations, that is, the change between the estimator and what is estimated. We find the proposed Work Mean Square error rate value is 0.0005163 and existing work value is 6.982.

VII. CONCLUSION AND FUTURE SCOPE

The Hand gesture recognition input image to be confidential during testing phase has to be taken at same distance as that of training phase. The system is able to productively classify the hand sign on behalf of number and the system can be further extended to recognize alphabets, expressions, etc. A new technique is planned to increase the accuracy of gesture recognition system using Support Vector Machine, GA and PCA. We have compared proposed method with previous implemented method. From the results, it has been clearly seen that results for proposed method are good in comparison to old method. As the purpose provides the flexibility to the users and especially physically challenge users to define the gesture according to their viability and ease of use. In addition, the search procedure can be enhanced to increase the presentation of the system. The planned system is able to classify only the static images which can be extended more to recognize hand gesture in video as well. The results can be improved using BFO Algorithm instead of Back propagation neural network and Support Vector Machine. In future instead of offline recognition system an online recognition system can be designed. Dynamic images in background independent environment can be used.

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