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Hand Gesture Recognition System

[1]Dr. V.R.Dhawale, [2]Prof. Rana Afreen Sheikh, [3]Harish S. Palaspagar, [4]Rahul Kumar, [5]Jaywant N. Mhala

[1]Professor, K. K. Wagh Institute of Engineering Education and Research, Nashik, India
[2]Professor, Department of MCA, Vidyabharati Mahavidyalaya, Amravati, India
[3,4,5]Student, Department of MCA, Vidyabharati Mahavidyalaya, Amravati, India

***Abstract* - Hand gesture recognition system received great attention in the recent few years because of its manifoldness applications and the ability to interact with machine efficiently through human computer interaction. Recognition of Gestures helps and enables the humans to interact and communicate with computers and IT devices in a natural way. Hand Gesture can be termed as interactive process of interaction without physical connectivity. Gesture recognition helps in the environment known to be HMI (humans communication with the machine and interact) and that does not include touch of mechanical devices. Techniques such as Image process are at prime and sometimes use of hard ware devices become redundant as moving towards hand gesture recognition.**

Keywords: Hand Posture, Hand Gesture, Human Computer Interaction (HCI), Segmentation, Feature Extraction.

I. INTRODUCTION

The essential aim of building hand gesture recognition system is to create a natural interaction between human and computer where the recognized gestures can be used for controlling a robot or conveying meaningful information. And to improve the interaction between human, devices and machines in a virtual platform there is automatic gesture recognition.

Human computer interaction (HCI) also named Man-Machine Interaction (MMI) refers to the relation between the human and the computer or more precisely the machine, and since the machine is insignificant without suitable utilize by the human. There are two main characteristics should be deemed when designing a HCI system as mentioned in functionality and usability. System functionality referred to the set of functions or services that the system equips to the users, while system usability referred to the level and scope that the system can operate and perform specific user purposes efficiently. The system that attains a suitable balance between these concepts considered as influential performance and powerful system. Gestures can be static (posture or certain pose) which require less computational complexity or dynamic (sequence of postures) which are more complex but suitable for real time environments. Gestures used for communicating between human and machines as well as between people using sign language. Gesture recognition system applications and its growing importance in our life especially for Human computer Interaction HCI, Robot control, games, and surveillance, using different tools and algorithms. This work demonstrates the advancement of the gesture recognition systems, with the discussion of different stages required to build a complete system with less erroneous using different algorithms.

II. TECHNOLOGY

The recognition of Gesture is most important widely accepted Technology advancement. There have been commercial and non commercial products through this technology. The Gesture recognition includes different types of gestures that include goodbye gesture by hands and nodding by head. The computers and IT devices majorly function on detection process followed by track of the object and finally recognizing it. So we can term the model as DTR. And as the technology has advanced the recognition can be experienced on the basis of color, share and gesture. So gesture recognition has a close association with software and primary all about software. We always try to make IT devices, computer systems more attractive, attentive and clever. The IT devices and Computer at first understands the series of fingers and movements, reducing the physical contact between human and humans. The recognition of gesture is valuable in number of interactions and important tool for robots and human interactions. The sensor technology is at forefront and most of the devices and gadgets come fitted with sensors today to move ahead with gesture recognition. Sensors make the most of the detection and the conversion into signals happen and passing on to devices. And there is no physical contact information between machine and device. The facial and other body gestures focus more on making the machines to understand the emotions of human Hand gesture recognition aims at some of the shapes of basic nature by hands. Gestures of hands can be a perfect way to express feelings and transmit message. It involves some applications like languages of signs and is used for various purposes.

Hand gesture recognition now days termed as natural part of human interaction and is one of the growing fields. It has evolved in a step by step procedure for instance communication between the special and handicapped people has got a fresh lease of life and in the same manner and second

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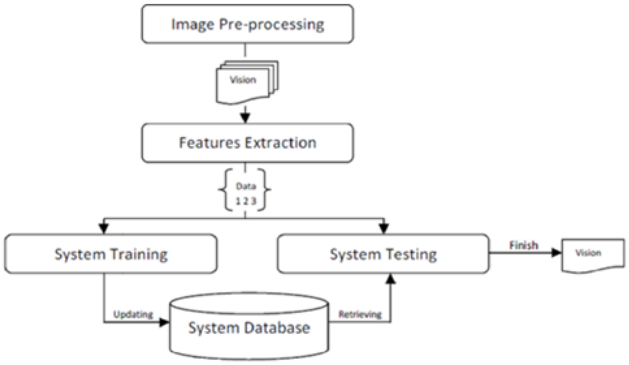
step has roots connected with the artificial intelligence through gesture communication between man and machine.

III. SYSTEM ARCHITECTURE

Two types of gesture modes includes at Offline and Online gestures modes where Online Gestures are primarily aimed at rotation of tangible object While Offline Gestures includes the gestures and get involve and processed with object after interaction of user, for instance we say menu activation HGR system involves different types of four phases.

- Data acquisition
- Pre-processing and Hand segmentation
- Feature extraction
- Recognition



Architecture for Hand Gesture Recognition system

Image Processing involves form of processing of signals acting as input and also involves digital image process. Image processing and capturing includes input devices to catch and track different movements and performance and that includes: Stereo cameras, Single camera, and wired gloves. Technology and Wired gloves provide inputs to the electronic devices such as computers using mechanical tracking devices. It can include optic cables for appropriate hand pose. The Gloves are fitted with hyper sensors for providing the information regarding hand and finger position. In the case of depth aware cameras they can be use of structured lights and there is creation of map or an image and can e use full in the capture of hand gestures. And then there are two lens cameras with two lenses and at one particular time can two pictures and can be help full in 3D representation.

Technology on the basis of vision: Image based models and Model based techniques. Model based techniques involve three dimensional model using hands and in the Image based methodology the gestures are detected by capture of motions of users during gesture process.

IV. GESTURE BASED APPLICATIONS

Hand gestures recognition system has been applied for different applications on different domains, as mentioned including; sign language translation, virtual environments, smart surveillance, robot control, medical systems etc. overview of some hand gesture application areas are listed below.

A) Sign Language Recognition: One of the best known natural forms in the field of language is Sign language and is also raw in nature. Since from long that sign language has become a part of human civilization even before the verbal discussions. Now the sign language has taken a special space in the fields of specially disables, armed forces and Air traffic controls. Extremely helpful in road and long distance communication. Gestures can be termed as part of initial forms of communication to express feelings and needs with expressions. Sign language has collaborated IT and Gesture very well through the recognition aspect and its due to sign language that Hand and sign recognition has moved ahead.

B) Robot Control: Controlling the robot using gestures considered as one of the interesting applications .In this field proposed a system that uses the numbering to count the five fingers for controlling a robot using hand pose signs. The orders are given to the robot to perform a particular task, where each sign has a specific meaning and represents different function for example, “one” means “move forward”, “five” means “stop”, and so on.

C) Graphic Editor Control: Graphic editor control system requires the hand gesture to be tracked and located as a preprocessing operation. Used 12 dynamic gestures for drawing and editing graphic system. Shapes for drawing are; triangle, rectangular, circle, arc, horizontal and vertical line for drawing, and commands for editing graphic system are; copy, delete, move, swap, undo, and close.

D) Virtual Environments: Virtual environment is the most happening thing now these days and is applicable to couple of simulated computer environment, simulating the physical presence in the reality and imaginary world. The virtual aspect involves lot of sensory process and information and involves primary visual surroundings, with special stereoscopic displays on a computer screen.

E) Numbers Recognition: Another recent application of hand gesture is recognizing numbers. Proposed an automatic system that could isolate and recognize a meaningful gesture from hand motion of Arabic numbers from 0 to 9 in a real time system using HMM.

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F) Television Control: Hand postures and gestures are used for controlling the Television device . In a set of hand gesture are used to control the TV activities, such as turning the TV on and off, increasing and decreasing the volume, muting the sound, and changing the channel using open and close hand .

G) 3D Modeling: To build 3D modeling, a determination of hand shapes are needed to create, built and view 3D shape of the hand. Some systems built the 2D and 3D objects using hand silhouette. 3D hand modeling can be used for this purpose also which still a promising field of research.

V. CONCLUSIONS

In this paper various methods are discussed for gesture recognition, these methods include from Neural Network, HMM, fuzzy c-means clustering, besides using orientation histogram for features representation. For dynamic gestures HMM tools are perfect and have shown its efficiency especially for robot control. NNs are used as classifier and for capturing hand shape in. For features extraction, some methods and algorithms are required even to capture the shape of the hand as in, applied Gaussian bivariate function for fitting the segmented hand which used to minimize the rotation affection. The selection of specific algorithm for recognition depends on the application needed. In this work application areas for the gestures system are presented.

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