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Comparative Learning of Hand Gesture Recognition Method

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Abstract: ***Gesture Recognition means detection and identification of gestures originates from body motion but generally originate from face or hand. Present focuses in the field include feeling recognition from the face and hand gesture recognition with the improvement of ever-present computing, current user interaction approaches with keyboard, and mouse and pen are not enough. Due to the restriction of these devices the useable command set is also narrow. Direct use of hands as an input device is an smart technique for providing natural Human Computer Interaction which has evolved from text-based interfaces through, graphical-based interfaces, multimedia-supported interfaces. Human duplication for his surrounding atmosphere makes him interfere in every details of this massive environment, hear impaired people are gesturing with each other for delivering a particular message, this method of communication also attracts human duplication concentration to express it on human-computer interaction. Gesture recognition enables humans to interface with the machine and correlate naturally without any mechanical devices. The applications of gesture recognition are various, ranging from sign language through medical analysis to necessary reality. A comparative study included in this paper with focusing on different segmentation, features extraction and identification tools, research advantages and drawbacks are provided as well.***

1. Introduction

Gesture recognition is a fact in engineering and language technology with the aim of interpreting human gestures through mathematical algorithms. Gestures can initiate from any bodily motion or situation but normally originate from the face or hand. Recent focuses in this field consist of feeling identification from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. Gesture recognition can be seen as a way for computers to begin to understand human-body language. Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices.

The touch less technology it demonstrates may appear several decades sooner as is evident from the awareness that Vision Based Interfaces have gained in the latest years. Gestures are a powerful means of communication among humans. Hand gestures offer a separate complementary modality to speech for expressing ones ideas. So, natural relations between humans and computing devices can be achieved by using hand gestures for communication between them. The key problem in gesture interaction is how to make hand gestures understood by computers. The approaches present can be mainly divided into “Data-Glove based” and “Vision Based” approaches. The Data-Glove based methods apply sensor devices for digitizing hand and finger motions into multi-parametric data. The additional sensors make it easy to collect hand configuration and movement. However, the devices are somewhat expensive and bring much cumbersome experience to the users. In contrast, the Vision Based methods need only a camera, thus realizing a natural interaction between humans and computers without the use of any additional devices.

The purpose of this paper is present a review of Vision based Hand Gesture Recognition techniques for human computer interaction, consolidating the a variety of available approaches, pointing out their general advantages and disadvantages. Even though other reviews have been written on the subsets of hand posture and gesture recognition this one specially relates to the vision based technique and is up-to-date.

2. Literature Survey

Centre for Applied Internet Research (CAIR), Glyndwr University, UK proposed a review of the history of Gesture controlled user interface (GCUI), and identifies trends in technology, application and usability. Their findings conclude that GCUI affords practical opportunities for exact application areas and especially for users who are uncomfortable with more commonly used input devices. They investigated different types of gestures, applications, technology, issues, results and interfaces from existing study. They consider the next direction of gesture controlled user interfaces as rich user interface using gestures seems suitable for current and future everywhere and ambient devices.

Institute of Information technology, University of Dhaka, Bangladesh; Centre for Applied Internet Research, United Kingdom on September 2011 in Journal of Software Engineering and to meet the challenges of everywhere computing, ambient technologies and an increasingly older population, research-ers have been trying to break away from traditional modes of interaction. A history of studies over the past 30 years reported in this paper suggests that Gesture Controlled User Interfaces (GCUI) now provide practical and affordable opportunities, which may be appropriate for older and disabled people. They have developed a GCUI prototype application, called Open Gesture, to help users carry out everyday activities such as making phone calls, controlling their television and performing mathematical calculations. Open Gesture uses simple hand gestures to perform a diverse range of tasks via

a television interface. They describe Open Gesture and report its usability evaluation. They conclude that this inclusive technology offers some potential to improve the independence and quality of life of older and disabled users along with general users, although there remain significant challenges to be overcome.

University of Twente, Human Media Interaction, March 2006 proposed that gestures are not often used to control domestic appliances in a modern household. They explain a research project on the current use of gestures in domestic appliances and possible usage in the future. First, a literature survey is done in different gesture input possibilities, also advantages and disadvantages are discussed. After that, a few current domestic appliances with their input possibilities are reviewed. Using the described input methods, new gesture control methods are introduced in the domestic field. A remote control with touchpad or capacitive field controls came out as an interesting device. It is concluded that a remote control with a touch sensitive interface in combination with a displayed remote control screen is preferred above the traditional remote control using push buttons.

International Journal of Artificial Intelligence & Applications (IJAIA), in July 2012 proposed hand gesture recognition: a literature review. They told that 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. They presented a survey of recent hand gesture recognition systems. Key issues of hand gesture recognition system are presented with challenges of gesture system.

In International Journal of Computer, Information Technology & Bioinformatics (IJCITB) told that human-robot voice interface plays a key role in many application fields. Hand gesture is a very natural form of human interaction and can be used effectively in human computer interaction (HCI). Developments in field of communication have enabled computer commands being executed using hand gestures. They discusses hand glove-based techniques that use sensors to measure the positions of the fingers and the position of the hand in real-time. Interaction using gesture technology for effective communication empowering physically challenged to interact with machines and computing devices including 3-D graphic interactions and simulations. They focus on wireless data gloves that are proposed to be used for gesture recognition and accordingly robot movement will take place.

Air Force Research Laboratory proposed the technology and application of gesture based control. The technology for using hand, body and facial gestures as a means for interacting with computers and other physical devices. The basis for gesture based control technology, methods for acquiring and processing such signals from human operators, applications of these control technologies, and anticipated future developments.

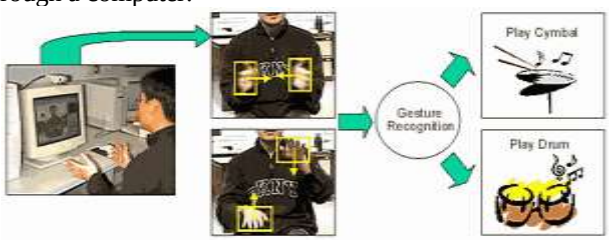
3. Overview of Gesture Technology

Humans naturally use gesture to communicate. It has been verified that young children can willingly learn to communicate with gesture before they learn to talk. A gesture is non-verbal communication which is made with a part of the body. We use gesture as an alternative of or in combination with verbal communication. Using this process, human can interface with the machine without any mechanical devices. Human activities are typically analyzed by segmenting them into shorter and reasonable format. The movements vary person to person. It can be used as a command to control different devices of daily activities, mobility etc. So our natural or instinctive body movements or gestures can be used as command or interface to operate machines. Gestures can initiate from any physically motion but commonly originate from the face or hand. Current focuses in the field include feeling recognition from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse. Gesture recognition enables humans to interface with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant.

In gesture recognition technology, a camera reads the movements of the human body and communicates the data to a computer that uses the gestures as input to control devices or applications. Interface with computers using gestures of the human body, typically hand movements. For example, a person clapping his hands in front of a camera can produce the sound being crashed together when the gesture is fed through a computer. The technology also has the potential to change the way users interact with computers by eliminating input devices such as joysticks, mice and keyboards and allowing body to give signals to the computer through gestures such as finger pointing.

Gesture Recognition Technology

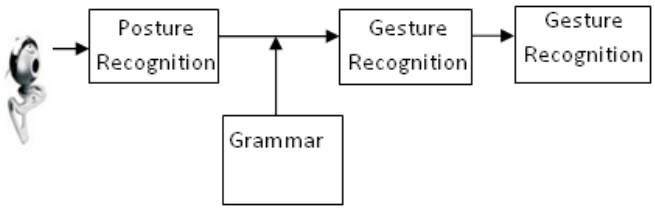
In gesture recognition technology, a camera records the activities of the human body and communicates the data to a computer that uses the gestures as input to control devices or applications. For example, a person clapping his hands together in front of a camera can produce the sound of cymbals being crashed together when the gesture is fed through a computer.



Gesture Recognition Technology

4. Hand Posture and Gesture Recognition Technology

The human hand has a composite anatomical arrangement consisting of many connected parts and joints, involving complex relations between them providing a total of roughly 27 degrees of freedom. User Interface development requires a sound understanding of human hand's anatomical construction in order to determine what kind of postures and gestures are comfortable to make. Hand posture is a static hand pose without contribution of activities A hand gesture is defined as a active movement referring to a series of hand postures connected by continuous motions over a short time duration, such as waving good-bye. In vision based hand gesture recognition system, the movement of the hand is recorded by video camera. This input video is decomposed into a set of features taking individual frames into report. Some form of filtering may also be performed on the frames to remove the needless data, and highlight necessary components. For example, the hands are isolated from other body parts as well as other background objects. The isolated hands are recognized for different postures. Since, gestures are nothing but a series of hand postures connected by continuous motions, a recognizer can be trained against a possible grammar.



Hand Gesture Recognition Process

Gesture Recognition and Pen Computing
In some literature, the term gesture recognition has been used to refer more closely to non-text-input handwriting symbols, such as inking on a graphics tablet, multi-touch gestures, and mouse gesture recognition. This is computer interaction through the drawing of symbols with a pointing device cursor (see discussion at Pen computing).

Gesture Only Interfaces
The gestural equivalent of express planning interfaces is those which use gesture alone. These can range from interfaces that recognize a few symbolic gestures to those that execute fully fledged sign language analysis. Similarly interfaces may recognize static hand poses, or dynamic hand motion, or a combination of both.. In this section we will review the technology used to capture gesture input, then describe examples from symbolic and sign language recognition. Finally we summarize the lessons learned from these interfaces and provide some recommendations for designing gesture only applications.

Tracking Technologies
Gesture-only interfaces with syntax of many gestures typically require precise hand pose tracking. A common technique is to instrument the hand with a glove which is equipped with a number of sensors which provide information about hand position, orientation, and flex of the fingers. The first commercially available hand tracker, the Data glove, is described in Zimmerman, Lanier, Blanchard, Bryson and Harvill (1987), and illustrated in the video by Zacharey, G. (1987). This uses thin fiber optic cables running down the back of each hand, each with a small crack in it. Light is shone down the cable so when the fingers are bent light leaks out through the cracks. Measuring light loss gives an accurate reading of hand pose. The Data glove could measure each joint bend to an accuracy of 5 to 10 degrees (Wise et. al. 1990), but not the sideways movement of the fingers (finger abduction). However, the Cyber Glove developed by Kramer (Kramer 89) uses strain gauges placed between the fingers to measure abduction as well as more accurate bend sensing (Figure XX). Since the development of the Data glove and Cyber glove many other gloves based input devices have appeared as described by Sturman and Zeltzer

Natural Gesture Only Interfaces
Effective gesture interfaces can be developed which respond to natural gestures, especially dynamic hand motion. This responds to hand position using two closeness sensors, one vertical, the other horizontal. Proximity to the vertical sensor controls the music pitch, to the horizontal one, loudness. What is amazing is that music can be made with orthogonal control of the two prime dimensions, using a control system that provides no fixed reference points, such as frets or mechanical feedback. The hands work in extremely fine ways to expressive steps in what is actually a continuous control space. The Theramin is successful because there is a direct mapping of hand motion to continuous feedback, enabling the user to quickly build a mental model of how to use the device.

Gesture Based Interaction
The Cyber Glove captures the position and movement of the fingers and wrist. It has up to 22 sensors, including three bend sensors on each finger, four abduction sensors, plus sensors measuring thumb crossover, palm arch, wrist flexion and wrist abduction.

Cyber Glove

When hand pose information has been captured by the gloves, gestures can be known using a number of different techniques. Time dependent neural networks may also be used for dynamic gesture recognition even though a more common approach is to use Hidden Markov Models. Hidden Markov Models may also be used to interactively segment

out glove input into individual gestures for recognition and perform online learning of new gestures. In these cases gestures are typically documented using pre-trained templates; however gloves can also be used to identify natural or untrained gestures.

While instrumented gloves offer very accurate results they are expensive and encumbering. Computer vision techniques can also be used for gesture recognition overcoming some of these restrictions. A good review of vision based gesture recognition is provided by Palovic in (1995). In general, vision based systems are more natural to use that glove interfaces, and are capable of excellent hand and body tracking, but do not provide the same accuracy in pose determination. However for many applications this may not be important. Sturman and Zeltzer point out the following limitations for image based visual tracking of the hands (Sturman and Zeltzer 1994):

- The resolution of video cameras is too low to both determine the fingers easily and cover the field of view encompassed by broad hand motions.
- The 30- or 60- frame-per-second conventional video technology is not enough to capture rapid hand motion.
- Fingers are difficult to track as they occlude each other and are occluded by the hand.

There are two different approaches to vision based gesture recognition:

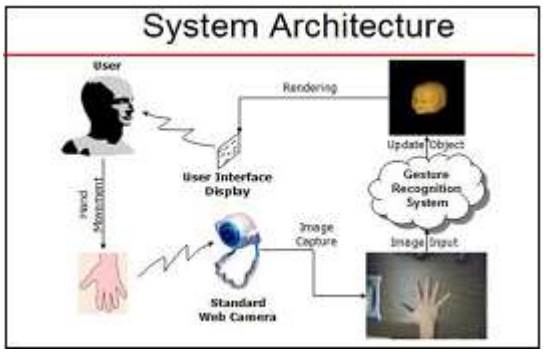
Model Based Technique
This technique try to create a three-dimensional model of the users hand and use this for recognition, and image based techniques which calculate recognition features directly from the hand image.

Image Based Technique:
Rehg and Kanade (1994) describe a vision-based approach that uses stereo camera to create a cylindrical model of the hand. They use finger tips and joint links as features to align the cylindrical components of the model. Etoh, Tomono and Kishino (1991) report similar work, while Lee and Kunii use kinematic constraints to improve the model matching and recognize 16 gestures with XX% accuracy (1993). Image based methods typically segment flesh tones from the background images to find hands and then try and extract features such as fingertips, hand edges, or gross hand geometry for use in gesture recognition. Using only a coarse description of hand shape and a hidden markov model, Starner and Pentland are able to recognize 42 American Sign Language gestures with 99% accuracy (1995). In contrast, Martin and Crowley calculate the principle components of gestural images and use these to search the gesture space to match the target gestures (1997).

Types of Gestures
Largely of the researches are based on hand gestures. There are researches about body gesture, finger point movement. In the early stage, researchers used gloves with microcontroller and connected with the device through a wire. Head gesture and gesture with voice were also in the research, but hand gesture was the most dominant part of gesture control system. In computer interfaces, two types of gestures are distinguished:

Offline Gestures: Those gestures that are processed after the user interaction with the object. An example is the gesture to activate a menu.

Online Gestures: Direct manipulation gestures. They are used to scale or rotate a tangible object.



System Architecture

Here we can see that the user action is captured by a camera and the image input is fed into the gesture recognition system, in which it is processed and compared efficiently with the help of an algorithm. The virtual object or the 3-d model is then updated accordingly and the user interfaces with machine with the help of a user interface display.

Applications
Hand gesture recognition finds applications in various domains including virtual environments, smart surveillance, sign language translation, medical systems etc. There are various types of gestures which can be identified by computers.

- Sign language recognition. Speech recognition can transcribe speech to text; certain types of gesture recognition software can set down the symbols represented through sign language into text.
- Selection computer interfaces. Earlier the traditional keyboard and mouse setup to work together with a computer, strong gesture recognition could permit users to achieve common tasks using hand or face gestures to a camera.
- For robotics. By using appropriate sensors (accelerometers and gyros) wear on the body of a patient and by reading the values from those sensors, robots can help in patient treatment. The best example can be stroke analysis.
- Remote control. During the use of gesture recognition, "remote control with the wave of a hand" of various devices is possible. The signal must not only indicate the desired response, but also which device to be controlled.
- Directional indication through pointing. Pointing has a very particular purpose in our society, to reference an object or location based on its position relative to ourselves. The use of gesture recognition to decide where a person is pointing is useful for identifying the context of statements or directions. This application is of particular interest in the field of robotics.
- Control through facial gestures. Controlling a computer through facial gestures is a useful application of gesture recognition for users who may not physically be able to use a mouse or keyboard. Eye tracking in particular may be of

use for controlling cursor motion or focusing on elements of a display.

- Virtual controllers. On behalf of systems where the act of finding a physical controller could need too much time, gestures can be used as an another control mechanism. Controlling secondary devices in a car, or controlling a television set are examples of such usage.
- Hand gestures are an attractive method for communication with the hard of hearing and dumb. One of the most structured sets of gestures is those belonging to any of the number of sign languages. In sign language, each gesture already has assigned meaning, and strong rules of context and grammar may be applied to make recognition tractable.
- Researches show that gesture based applications can be used for many different things, entertainment, controlling home appliance, tele-care, tele-health, elderly or disable care. The span of the application shows us the importance of more researches in a gesture controlled system. Most applications are to replace traditional input devices like keyboard and mouse, accessible application for elderly-disable like accelerometer. Initial applications were on pc applications for text edit, presentation. Using digital camera rather than sensor has provided new dimension to develop gesture based user interface development. Now people can interact with any media using gesture to control wide range of applications.
- The healthcare area has also not been left untouched by this technological wave. Wachs et al. [31] developed a gesture based tool for sterile browsing of radiology images. A sterile human-machine interface is of best importance because it is the means by which the surgeon controls medical information, avoiding patient contamination, the operating room and the other surgeons. The gesture based system could replace touch screens now used in many hospital operating rooms which must be sealed to prevent accumulation or spreading of contaminants and requires smooth surfaces that must be thoroughly cleaned after each procedure – but sometimes aren't. With infection rates at hospitals now at unacceptably high rates, the hand gesture recognition system offers a possible alternative.
- In June 2008, Toshiba properly announced the details of Qosmio laptops offering what may be the first integration of gesture recognition and day-to-day computing. With Toshiba's media centre software, users can pause or play videos and music by holding an open palm up to the screen. Make a fist and your hand functions as a mouse, pulling a cursor around the screen. Flip your thumb up and down to click
- When robots are moved out of factories and introduced in too ur daily lives they have to face many challenges such as cooperating with humans in complex and uncertain environments or maintaining long-term human-robot relationships.

Technology

The ways of recognizing the gesture can be considered as a main progress of the technology.. Gestures have been captured by using infrared beams, data glove, still camera, wired and many inter-connected technologies like gloves, pendant, infrared signal network server etc in the past. Recent vision technique, video and web cam based gesture recognition has made it possible to capture any spontaneous gesture for any ubiquitous devices from the natural environment with 3D visualization. Lenman has developed a prototype for remote control of home electronics, such as TV and CD-player. It describes a project that explores computer vision based analysis of hand gestures for developing new forms of HCI. Gesture based research are now moving towards everyday application for even older adults with simple and inexpensive implementation.

Commercial Products

First commercial products of gesture technology for general user launched in 2003, 23 years after the research works started. Still games industry is the main target of the products. But health, care homes industries are also getting focus gesture recognition becomes intuitive and natural. There are important issues addressed by the researchers based on traditional system, usability. Natural intuition of the gesture control was addressed by most of the research. Natural connection with the group work like meeting, gesture recognitions , providing feedback of the gestures through visualization, sound etc, gesture training, common or unusual gesture are some issues which give a direction towards further research for elderly.

Current Opportunities for Gesture Technology

It's to find the place where gesture commands are captured as a command or users can get the feedback. There is a special interest for the place or interface of gesture commands as HCI is progressing rapidly in recent years. Gestural interfaces are electronic analogues to pencil and paper. Gestural interfaces have a number of potential advantages and couple of potential disadvantages. There are varieties of interfaces in the researches in the table like natural , large screen, PC/Laptop based, LED light, audio-visual, mobile handheld etc. From the study we can see the opportunities of implementing the technology in different areas. The list can be following

1) Entertainment

Gesture technology can provide more entertainment opportunity for any type of users. Gesture Tek many different ways of entertainment using gesture such as interactive advertisement, signage, movies, and screens. Sony Eyetoy, Microsoft"s X-box has demonstrated different entertainment opportunities such as playing music, personalized gaming etc.

2) Artificial Intelligence

People, devices are going to integrate more with each other and will soon become part of our daily life. Using gesture based technology will play important part in this intelligent life. Gesture from any part of the body can provide the commands of communication or even to control the curtain of the window. Robotic industry is also using gesture technology to manage and control the activities of the robot as part of the Human Robot interaction. Based on networking technologies &hand gestures, users can connect multiple devices.

3) Simulation

Body gesture creates the simulation of human body activities in the screen. Physical simulation can develop the realism of the resulting gestural animation in several ways. Gesture

develops a stimulating computer- generated virtual reality analysis world that guides patients through clinician-prescribed interactive treatment workout, games and activities that can target specific body parts. Patient performance is measured and recorded.

4) Training & Education

The technology solution can be developed for training and education purpose. In the analysis or fitness centres, it can train people automatically based on the users profile, body structure. Taking natural input from the body movements is the most important advantage here over mouse or keyboard.

5) Assistive Living

Technologies such as multi-agent systems, safe communications, hypermedia interfaces, rich environments, increased intelligence of home appliances, and collaborative virtual environment are now converging and represents an important enabling factor for the design and development of virtual elderly support community environments.

No.	Advantages	Disadvantages
1	Speed and sufficient reliable For recognition system. Good performance system with Complex background.	Irrelevant object might overlap with the hand. Wrong object extraction appeared if the objects larger than the hand.
2	The radial form division and boundary histogram for each extracted region, overcome the chain shifting problem	The proposed method is susceptible to errors, especially in shapes like square and circular.
3	Exact shape of the hand obtained led to good feature extraction. Fast and powerful results from the proposed algorithm.	System limitations restrict the applications such as; gestures are made with the right hand only, the arm must be vertical, the palm is facing the camera, background is plain and uniform.
4	Simple and active, and successfully can recognize a word and alphabet. Automatic sampling, and augmented filtering data improved the system performance	Required long time for Learning; several hours for learning 42 characters, and four days to learn ten words. Large difference in recognition rate for both registered and unregistered people.
5	Recognized both isolated and meaningful gestures for Arabic numbers.	Recognition limited to numbers only.
6	The system successfully recognized static and dynamic gestures.	The system doesn't reflect the dynamic gesture characteristics.
7	Hand Saturation algorithm kept the hand object as a complete area.	The edge method less effective since some an important feature was lost.
8	Simple, fast, and easy to implement. It can be applied on real system and play games.	Similar gestures have different orientation histograms. Different gestures have similar orientation histograms. Any objects dominate the image will be represented as orientation histograms
9	Three different groups of features are examined to decide the good performance group.	The database samples, variation in scale, translation and rotation led to a misclassification in the.

5. Future Work

Technologies developed based on gesture are now really reasonable and converged with familiar and popular technologies like TV, large screen. Its ever-present and non-intrusive as we can install a camera or remote with the TV. From this paper we can see the trends of gesture controlled communication systems. Easing of the technology use, affordability and awareness indicate that gesture based user interface can open new opportunity for elderly and disable people. The older population numbered 36.3 million in 2004, an increase of 3.1 million or 9.3% since 1994 and its growing over time. There will be more elderly people and fewer younger ones to care for them. So we need to invest much more heavily in Assistive Living solutions. The two important aims of the research are to identify the different gestures of elderly and disabled people for communication and to design a rich augmented-reality interface for communication via ubiquitous device such as a television set.

Gestures are proposed to play an increasingly important role in human-computer interaction in the future. Facial Gesture Recognition Method could be used in vehicles to alert drivers who are about to fall asleep. Area of Hand gesture based computer human interaction is very vast. Hand recognition system can be useful in many fields like robotics, computer human interaction and so make hand gesture recognition offline system for real time will be future work to do. Support Vector Machine can be modified for reduction of complexity. Reduced complexity provides us less computation time so we can make system to work real time.

6. Open Issues

Vision based hand gesture recognition is still an important area of research because the available algorithms are relatively primitive when comparing with mammalian vision. A main problem hampering most approaches is that they rely on several underlying assumptions that may be suitable in a controlled lab setting but do not generalize to arbitrary settings. Also, recognition results presented in the literature are based on each author's own collection of data, making comparisons of approaches impossible and also raising suspicion on the general applicability. Moreover, most of the methods have a limited feature set. The latest trend for hand gesture recognition is the use of AI to train classifiers, but the training process usually requires a large amount of data and choosing features that characterize the object being detected is a time consuming task. Another problem that remains open is recognizing the temporal start and end points of meaningful gestures from continuous motion of the hand. This problem is sometimes referred to as "gesture spotting" or temporal gesture segmentation. The ways to reduce the training time and develop a cost effective real time gesture recognition system which is robust to environmental and lighting conditions and does not require any extra hardware poses grand yet exciting research challenge.

7. Conclusion

In today's digitized world, processing speeds have increased dramatically, with computers being advanced to the levels

where they can help humans in complex tasks. Yet, input technologies seem to cause a major blockage in performing some of the tasks, under-utilizing the available resources and restricting the expressiveness of application use. Gestures are expressive, meaningful body motions involving physical movements of the fingers, hands, arms, head, face, or body with the intent of: conveying meaningful information, interacting with the environment. Hand Gesture recognition comes to rescue here. Computer Vision methods for hand gesture interfaces must surpass current performance in terms of robustness and speed to achieve interactivity and usability.

Constructing an efficient hand gesture recognition system is an important aspect for easily interaction between human and machine. In this work we provided a comparative study on various gesture recognition systems with emphasis on segmentation and features detection and extraction phases which are essential for gesture modeling and analysis.

Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse. Gesture recognition is an extensively developed technology available designed to identify human position, action, and manipulation. Gestures are used more and more to facilitate communication with digital applications because of their expressive nature. Gesture recognition can be conducted with techniques from computer vision and image processing. There are many challenges associated with the accuracy and usefulness of gesture recognition software.

A review of vision-based hand gesture recognition methods has been presented. Considering the relative infancy of research related to vision based gesture recognition remarkable progress has been made. To continue this momentum it is clear that further research in the areas of feature extraction, classification methods and gesture representation are required to realize the ultimate goal of humans interfacing with machines on their own natural terms. Among the various ways of gesture recognition like Hand, Face and Body Gesture Recognition, Hand Gesture Recognition is efficient technique to recognize human gestures due to its simple and greater accuracy features.

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