



**CONTROLLING MOUSE POINTER USING GESTURE
RECOGNITION**

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Under the guidance of the

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Abstract

Gesture Recognition is the process during which images or videos are processed to gather the gestures through them and utilizing those gestures to give commands or to perform specific tasks. It is utilized in almost every field today as its creating virtual environment in which human computer interaction became possible. It has its various applications but here efforts are going on to gather the gestures and then recognize them to control the mouse pointer clicks so that user will not be bound or restricted with the traditional devices.

Acknowledgement

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Declaration

I hereby declare that this proposed dissertation entitled **Controlling Mouse Pointer using Gesture Recognition** for M.Tech (C.SE) Degree is entirely my original work and is fully acknowledged references under the supervision of mine mentor Ms. Sandeep Kaur (Assistant Professor), Department of Computer Science and Engineering at Lovely Professional University.

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Date

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It is certified that above statement of the student is correct to the best of my knowledge.

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Date

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CHAPTER-1

INTRODUCTION

1.1 Gesture Recognition: It is the process of recognizing human gestures that can be hand movement, eye blink, and different hand postures etc. using various mathematical algorithms. Gesture recognition is the new concept that is the section of the computer science branch. This branch of computer science utilizes various tools and technologies to understand gestures given by the human being. Gestures can be given by diverse human body poses or even by presenting any body movements (motions). In the beginning focus was on hand gestures but now day's concentration is on emotion recognition on what efforts are going on. Emotion gestures based on face gestures like eye blink, nose position and mouth open and closed position etc.

Gestures are recognized with the practice of cameras and various algorithms grounded on computer vision. With this gesture recognition breach between human being and computers can be occupied. With gesture recognition we can develop new era of artificial intelligence in which computers are not merely grounded on text or GUI's. With gesture recognition, obstacle can be removed of user occurrence with the keyboard and mouse to operate the system. With gesture recognition we can control our mechanical devices like mouse to operate to computer system. Touch of fingers on screen, hand movements, facial expressions or emotions can be used to control mouse to operate the system. Gesture recognition is performed with the assistance of image processing and computer vision techniques. Gesture recognition is not bounded with traditional hardware's like keyboard and mouse. Now through thesis or research new hardware is developed or can be developed. With the gesture recognition we are moving from narrow way of text based interface's to wider way of non-text based interface providing multi touch gestures, mouse gestures etc. Pen computing is used in interaction process while drawing new symbols to give input to the system.

1.2 Gestures Types: Gestures are categorized into two types

- i. Online Gesture
- ii. Offline Gesture

Online Gesture: Gesture through which uninterrupted alterations, manipulations can be implemented. Transactions can be performed directly with online gestures like rotating any object, scaling any object.

Offline Object: Through offline gestures, manipulations, alterations or actions can be performed the moment user completes its interaction. Actions made with offline gestures can be like activating the menu's.

1.3 INPUT DEVICES (Hardware used to accumulate Gestures)

Various tools are used to recognize or to track gestures i.e. accumulated from various body actions. Various tools or devices are utilized to recognize gestures gathered from numerous images/videos captured through specialized cameras, gloves etc. and they are:

1. **Wired Glove:** It contains magnetic and inertial tracking devices i.e. used to recognize the position and rotation of the hand. It gathered the data through its tracking device and passes this data as gesture input to the system. Many of the gloves can recognize the finger joints, bending of the hand and fingers up to five to ten degree of accuracy level. First commercial device was named as a data glove that could detect the finger position, movement and joints. It utilizes the fibre optic cable and light passed by it is utilized in recognition as glove contains cracks at various specified positions the moment glove wore user bend his/her hand or fingers of it emits the light that's comes out through the cracks in the glove and that emitted light is registered/recorded and used for recognition purpose.
2. **Depth Aware Cameras:** DAC is the special device in this category. It creates maps based on depth calculated within short range. It generates three dimensional views of the data captured by it.

3. **Stereo Cameras:** It required two cameras to generate three dimensional view or representation of the data captured by these cameras. These cameras are related or known to each other, to generate 6- dimensional view we can utilize positioning reference like lexian stripe or infrared emitters.
4. **Controller Based Gestures:** It is software which utilized to capture the speed or the motion of the body with respect to time. They are called as controllers that behave as an extension to body, when any change occurs in pose speed or motion is captured with respect to time. Controllers like Wii Remote and the Myo which are serving the same purpose . Devices available in the market that termed as a controllers are LG Magic Wand, Loops and Scoops etc. They all utilize MEMS accelerometers, and sensors to capture or gather the gestures and convert them into control movements (cursor). Hand postures, fingers and other poses are captured with the assistance of sensors carrying special light that emits or emerge out when bending of the hands or finger is done.
5. **Single Camera:** Device which provides two dimensional view of the image clicked
i.e. used for recognizing the gestures. Before this approach was considered as an inappropriate for gesture recognition. But later initiative was taken by various companies to sort this issue as they offered various devices like Lenovo ultra-book, Vega Smartphone's, hisense's smart model's etc. which are capable of detecting gesture recognition

1.4 Algorithm: There are many approaches for gesture recognition and they are based on the nature of input data we are having. They yield high accuracy and efficiency while focusing on three dimensional views. Algorithms or approaches categories the objects and their movements on the bases of their behavior, features and other motions. The taxonomy given by the Quek offered HCI based on gestures whose coverage domain is the whole space of the gestures.

- i. **Manipulative**
- ii. **Semaphore**
- iii. **Conversational**

Gesture recognition is categorized into two types:

- i. **ThreeDimensional model Based**
- ii. **An Appearance based**

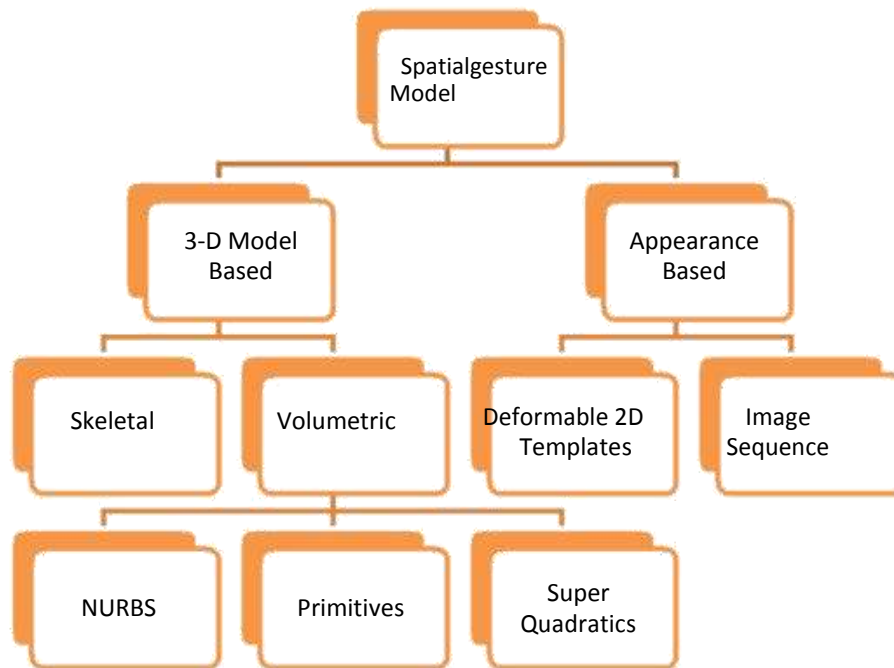


Figure 1 Gesture Recognition n its types

Three Dimensional Models Based:This method utilizes the main-features of the body to recognize gestures. It utilizes the joint points to recognize the posture like joint of hands, shoulders, arm joints etc.

Appearance Based:It utilizes the images or captured videos with above input devices to recognize the gestures through the images.

Three Dimensional Based Algorithms:It uses simple parameters for this approach. It matches the various body postures to the simple parameters or features which assist in gesture recognition through the orientation of the poses also.

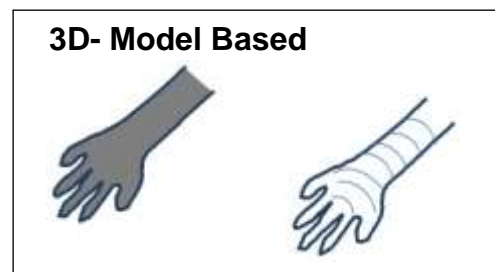


Figure 2 3D- Model Based

Skeletal Based Algorithm:In this approach, artificial skeleton of various bodies generated to recognize gestures through it. Different poses and directions are used in analysis procedure of gesture recognition and their relationships are also used for the same purpose like various joint angles.

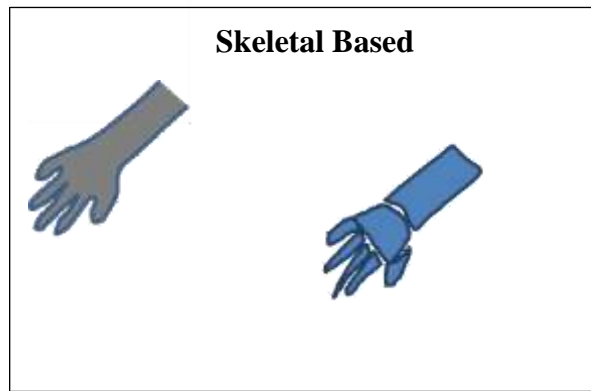


Figure 3 Skeletal based recognition

This approach has various positive points as compared to other approaches and they are:

- i. As its precise (specifically) focused on main key features or key parameters, it yields more accuracy, efficiency and speed.
- ii. Mainly focused on different body parts based on the category of gestures.
- iii. These algorithms utilize the approach of pattern matching with preset gesture patterns available in database.

Appearance Based Model:APM utilizes outline based approach. It generates the outline view of the various body parts. It mainly focused on hand postures. It also utilizes the videos to collect the various images sequentially to collect/gather the gestures based on appearance.

It can utilize two different views/scenarios

- i. Monoscope
- ii. Stereoscope

CHAPTER 2

LITERATURE REVIEW

Sr. No.	Author's Name	Tools/ Technology / Approach	Gains	Shortcomings	Future Work
P1	Aziz.et.al	OpencV, Visual C++	<ul style="list-style-type: none"> • Devices can be Controlled . • Helps the physically challenged people. • Home appliances & other devices can be organized <ul style="list-style-type: none"> ○ Fans ○ Doors ○ Lights ○ TV • Accuracy is 95%. 	<ul style="list-style-type: none"> • Efficiency can be higher if camera is capable to capture Arial view. • Segmentation problem is there even in normal view Due to weaker localization problem, Efficiency hinders with Complex backgrounds. 	<ul style="list-style-type: none"> • Segmentati on problem can be overcome. • Efficiency can be improved with better digital cameras having Arial click view.
P2	Dastur& Khawaja	OpencV HaarClassifi er	<ul style="list-style-type: none"> • It can pick and place load. • It can change the positions with the 	<ul style="list-style-type: none"> • Accuracy is of 0.6 degree at no load. 	<ul style="list-style-type: none"> • It can combine with complex algorithms based on vision approach to recognize and

			assistance of wheels.		<p>react automatically.</p> <ul style="list-style-type: none"> • It can be utilized with the machines specifically for drilling n ground work.
P3	Silver.et. Al	Face Tracking Software. Dasher text entry approach.	<ul style="list-style-type: none"> • Interface for disabled. • Used as a dual pointer. • Used for hand free text or data entry. • Act as an interface for gaming also. 	<ul style="list-style-type: none"> • More smoothness is required. • More accuracy is possible. 	<ul style="list-style-type: none"> • Mouth click is properly evaluated; it can be extended or improved. • Also improve the work by using other hand free sensor and click control approaches.
P4	Linsie& Arasi	MEMS Accerlo-meter	<ul style="list-style-type: none"> • Assist people with having speech & physical disability. • Interaction became easier. • Commands are given through speakers/output device (LCD). • Tolerance level of each axis is +- 5. • Potential for kinesis. • Using three dimensional axis than two dimensional axis. 	<ul style="list-style-type: none"> • 	<p>More advance algorithm can be developed for automation.</p>

			<ul style="list-style-type: none"> • More accurate. • Its user friendly. 		
P5	Ruiz.et.al	Android SDK & Java	<ul style="list-style-type: none"> • Develop taxonomy. • Support motion gesture design • Motion gestures are physical. • Complexity is based on the number of gestures. 	<ul style="list-style-type: none"> • All volunteers are literate grown-ups brought up in western culture. • Gestures are also influenced or based on western culture. 	<ul style="list-style-type: none"> • Can add more gestures that can be based on mobile phones. • Testing can be done with the participants from other culture to.
P6	Hachaj& Ogiela	MS Kinect Sensor	<ul style="list-style-type: none"> • All gestures are based on arm movements i.e. it's easy for participant to give gestures in relaxed and comfort manner and in natural way. • Recognition rate in <ul style="list-style-type: none"> ○ Slow speed is 92.5% ○ High speed is 77.5 % ○ Overall – 80.5% to 98.5%. 	<ul style="list-style-type: none"> • Random error of depth measurement increases with the increase in distance from sensor. • Any delay in recognizing will exceed to rule constants which will finally disturb The recognition procedure. 	Removal of disadvantages will be the future work.
P7	Kaura.et. Al	C++ with OpencV Arduino Wifly	<ul style="list-style-type: none"> • It provide real time palm recognition. • Its an effective and natural way for 	<ul style="list-style-type: none"> • Color based thresholdingc an be improved. 	<ul style="list-style-type: none"> • Periodic polling can be utilized for running commands in real time environment.

		L293D PHP	<p>controlling robots.</p> <ul style="list-style-type: none"> • Its within budget or cost is in budget as compared to existing system. • Commands are generated in real time. • It provides flexibility to the user and portability to system. 	<ul style="list-style-type: none"> • Continuous connection is Required Between server and Wifly. 	<ul style="list-style-type: none"> • Color based thresholding can be done.
P8	Dardas& Alhaj	SIFT, K means of bags,SVM	<ul style="list-style-type: none"> • Games can be controlled with the use of bare hand approach • High accuracy • It can be used for entertainment. • It creates virtual environment while providing more intelligent user interface. 	<ul style="list-style-type: none"> • It's using skin color region for hand Gesture recognition , it has to replace the other visible body parts with black Circle specially face. • SIFT is completely suitable to scaling, Orientation and partially To illumination changes. 	Appearance based techniques can be used to remove the shortcomings.

P9	Lee.et.al	Kinect Sensor,C# and Emgu CV 2.3.0 Library	<ul style="list-style-type: none"> • Interactive manipulative system is replacing the mouse • User can operate from any faraway location. 	<ul style="list-style-type: none"> • Restricted to very ambient conditions. • Failures can occur due to unexpected hand state change and Incorrect gestures. 	<ul style="list-style-type: none"> • Can enhance the recognition rate of hand gesture. • Can be applied to various environments as military or medical operations.
P10	Pandit.et. AI	Accelerometer, Microcontroller, Zigbee Wireless transmitter/ Receiver(XBEE)	<ul style="list-style-type: none"> • Can interact with three dimensional objects on screen. • Can be used effectively in teaching also. • Can assist physically disable people. • Can replace mouse (controlling device) with more convenient and intelligent interface. 	<ul style="list-style-type: none"> • Signal noise cause the problem in Gesture recognition. • During data transmission data in the form of packets can be lost. 	<ul style="list-style-type: none"> • Portability can be improved. • Size can be reduced by using smaller IC's chips.
P11	Chavez.et. AI	Hidden Markov Model	<ul style="list-style-type: none"> • Better environment and experience for both Dj's and public. • More transparency to theDj's Work. • Not bound or restricted to one place. • Public is also involved. 	<ul style="list-style-type: none"> • Controllers have used sea figures i.e. confusing and diverting the attention from their task. • Participants felt stressed 	<ul style="list-style-type: none"> • Efficiency can be improved. • Choice of figures can be provided to individual users.

				while using it.	
P12	Shin & Chun	OpenGL environment Principal component analysis	<ul style="list-style-type: none"> • HCI is done with eye and hand motion tracking. • Mouse is controlled with hand motion. • Solution for the physical disable or old people than the traditional system. 	<ul style="list-style-type: none"> • Recognition is effected with Light variations. • Difficult to operate in such kind of environment and also a lit bit difficult to understand it. 	<ul style="list-style-type: none"> • Can move on towards the facial recognition. • Lightening effects can be reduced with different approach.
P13	Madni.et .al	Interactive white board, laser beam.	<ul style="list-style-type: none"> • Students/user can explore the data to topics through collaborative activities. • Can be used for academics, meetings, brain storming sessions. 	<ul style="list-style-type: none"> • Performance and accuracy is not up to the mark. • It's difficult to understand and operate such system. • Training sessions are required to operate. 	<ul style="list-style-type: none"> • Can be tested in various learning environments. • Accuracy and performance can be improved.
P14	Sohn& Lee	UbiRo Software, IEEE 1394 camera	<ul style="list-style-type: none"> • Recognition and registration can be done. • Work on effective classification i.e. used for identifying indoor objects. 	<ul style="list-style-type: none"> • To perform double click need to fix the mouse pointer atleast for 300ms when 	<ul style="list-style-type: none"> • Can work on outdoor localizing system. • More effective algorithms can be used.

			<ul style="list-style-type: none"> • Manipulation is done easily. • Scan hardware for identification of the target objects for controlling mouse. 	<ul style="list-style-type: none"> • click is performed. • Varying lightening conditions and different viewpoints can cause problem. • careful management is required for UbiRo. • Difficult to operate As not having desk pad to operate properly. 	
P15	Kawal&Ja Granthana	Data gloves in 3D space, Orientation tracker, head mounting display	<ul style="list-style-type: none"> • Real environment feel is provided by generating virtual environment with different hardware's and software's. • Can control 3 out of five senses. • Virtual interface is available to recognize gestures and to perform sketching. 	<ul style="list-style-type: none"> • Expensive hardware IS required. 	<ul style="list-style-type: none"> • System performance can be improved.
P16	Manchand	Visual	<ul style="list-style-type: none"> • System accuracy is 	<ul style="list-style-type: none"> • Accuracy 	<ul style="list-style-type: none"> • Algorithm can be improved.

	a& Bing	Studio 2008 & Open CV	<p>upto70 %.</p> <ul style="list-style-type: none"> • Trajectory based gestures recognition is fast. • Reliable in real time system. • Can also be used for other multimedia applications. 	<p>level is not up to the mark.</p> <ul style="list-style-type: none"> • Lk method is slower than MHI (motion history of the images)i.e. still need improvement(65ms). • Suitable for real time applications. 	<ul style="list-style-type: none"> • More gestures can be used.
P17	Sheu.et.al	KINECT SENSOR,B PNN(back propogation neural network)	<ul style="list-style-type: none"> • Recognition rate of dynamic gestures and handwriting recognition system is 90%. • Average time of recognition is not exceeding 30ms. • User experiences real time interaction. • Brings the revolution in traditional TV system. 	<ul style="list-style-type: none"> • Uses skeleton joints done with button click not possible physical disable people. 	<ul style="list-style-type: none"> • Time can be reduced. • Accuracy or gesture recognition can be improved.
P18	Tuntakurn .et.al	Kinect sensor SDK 1.6,c# with .Net, viewer software	<ul style="list-style-type: none"> • Average time to complete the task is 2.25 • Accuracy of gesture recognition on average bases is 93%. 	<ul style="list-style-type: none"> • Average time can be reduced. • Accuracy can be improved. 	<ul style="list-style-type: none"> • Shortcoming removal can be considered as a future work.

		C++ with VTK(visualization toolkit library)	<ul style="list-style-type: none"> • Gestures can be easily controlled as are less in numbers. 	<ul style="list-style-type: none"> • No. of gestures can be increased. • Participant is using single arm both can be used. 	
P19		ALLSEE Sensor prototype leverage	<ul style="list-style-type: none"> • Uses 3-4 time less power than the existing system. • Device can be controlled while keeping in pocket or in bag like changing volume, mute. • Recognize eight different gestures like pushing-pulling to zoom in – out. • Distance can be more than 2 feet away. • Response time is less than 80 microsec i.e. 1000 times faster than an eye blink. 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Can be used with household devices. • Can be used with different electronic devices (smartphone).

Table 1 techniques, shortcomings and future work

Implementation of an efficient algorithm for Human Hand Gesture Recognition

In this paper, author used OpenCV and Visual C++ to implement algorithm to detect human hand gestures. With the help of this algorithm, devices like TV, doors, fans, lights etc can be controlled and organized. By using this algorithm physically challenged people can also be assisted. Accuracy level of this algorithm is 95%.

Shortcomings are:

1. Efficiency can be higher if camera is capable Arial view.
2. Segmentation problem is there even in normal view.
3. Due to weaker localization problem, efficiency hinders with complex backgrounds.

Future work:

1. Segmentation problem can be overcome.
2. Efficiency can be improved with better digital cameras having Arial click view.

Robotic Arm Actuation with 7DOF USING HAAR Classifier Gesture Recognition

In this paper, author used OpenCV and HAAR Classifier to design robotic arm with focus on 7 degree of freedom used. Hand gestures are used to control robotic arm. It can pick and place load. It's having wheels which assist in the task changing positions. Accuracy degree is 0.6 without any load.

ROBOT DRIVE LOGIC

Sr. No.	Left Motor	Right Motor	Motion
1	0	0	Stop
2	1	-1	Right
3	-1	1	Left
4	1	1	Forward
5	-1	-1	Reverse

Table 2 Robot Drive Logic

Shortcomings:

1. Accuracy level is only 0.6 even without any load.
2. Working is based and controlled by microcontrollers to control motors and to give commands to robot arm which can hinder the speed and controlling process.

Future Work:

1. It can combine with complex algorithms based on vision approach to recognize and react automatically.
2. It can be utilized with the machines specifically for drilling and ground work.

Human Factors Evaluation of a Vision- Based Facial Gesture Interface

In this paper, author used vision based face tracking system for cursor control by head movement. User used facetracking system to recognize and to control mouse. Nose is tracked and then used for controlling mouse pointer. Open mouth is used to perform click and for selection but for single click only. Performance is evaluated using Fitts Law equation by comparing various input devices. It can be used for physically disabled people, can be used as a dual pointer. User can be no more bound to enter text as it support hand free text entry and can also be used as an interface for gaming also.

Shortcomings are:

1. More smoothness is required while operating it.
2. More accuracy is possible.

Future Work:

1. Only single click is performed by mouth click, double click or right click can be performed.
2. Hand free sensor and click control can be improved

User defined Motion Gestures for Mobile Interaction

In this paper, author used MEMS accelerometer which is used to assist the people having speech and physical disability. It supports easier interaction through this mode as commands are given through speakers and other output devices. It used three dimension approach at the place of two dimension approach. It is user friendly and its tolerance level of each axis is up to +- 5.

Future Work:

1. More advance algorithm can be developed for automation.
2. Tolerance level can be improved by using other good techniques.

Rule Approach to recognize Human Body poses and gestures in real time

In this paper, author used Android, SDK and Java programming language. Here taxonomy is developed to recognize gestures to operate cell phones through gestures. It supports many motion gestures. Gestures used are quite complex and users who are using them should be from the western culture as gesture set is based on the western culture.

Shortcomings:

1. Volunteers should be literate and should be brought up in western culture environment as gesture set is based western culture.
2. Gestures are not based on any environment.
3. Limited gesture set is used.

Future Work:

1. More gestures can be added based on the cell phones.
2. Testing can be performed with the other users also which are not from the same environment i.e. Western culture.
3. Set of gestures can be changed based on the other themes as previous gestures are based on western culture.

Hand Gesture recognition using MEMS for specially challenged People

In this paper, author used probabilistic approach to recognize gestures with Microsoft Kinect. It uses rule based approach to recognize human body static postures and body gestures. The recognition rate of all tested gestures ranges from 80.5% to 98.5%. All gestures are based on arm movements i.e. it's easy for participant to give gestures in relaxed and comfort manner and in natural way. Recognition rate in slow speed is 92.5%, in high speed is 77.5% and on average bases is 80.5% to 98.5%.

Shortcomings:

1. Random error of depth measurement increases with the increase in distance from sensor.
2. Any delay in recognizing will exceed to rule constants which will finally disturb the recognition procedure.

Future Work:

1. Recognition rate can be improved by using better technologies or algorithm.
2. Gestures set can be improved.

Gesture controlled robot using Image Processing

In this paper, author controlled robot using gestures. Gestures are given to the robot to control it. Various gestures are given to operate it. C++ is used with OpenCV to control it. Aurdino Wi-fly L293D with PHP is used in this paper. Command are given to aurdino through the Wi-fly technique i.e. gestures captures with the help of camera and that is passed to aurdino device move it various directions (left, right, back, forward) , last given command stayed continued till the next command. It used real time palm recognition. It used an effective and natural way to control robot. Expense of project was comparatively moderate. All the commands are given in real time. It provide enough flexibility to the user and its portable system.

Shortcomings are:

1. Color based threshold can be improved.
2. Continuous connection is required between server and Wi-fly to control and pass the commands through camera to aurdino.

Future Work:

1. Periodic polling can be utilized for running commands in real time environment.
2. Color based thres-holding can be improved by using better techniques.

Hand Gesture Interaction with 3D Virtual Environment

In this paper, author used SIFT K-means to recognize gestures to create virtual 3D environment as it provides more intelligent interface. Skin detection technique is used, after this removal of undesirable body parts is done with the black circle which is compulsory to recognize gestures. Games can be controlled with the use of bare hand approach. It can be used for entertainment also.

Shortcomings are:

1. It's bound to replace the other body parts with the black circle specially face.
2. SIFT is completely suitable to scaling, orientation and partially to illumination changes.

Future Work:

1. Appearance based techniques can be used to remove the shortcomings.
2. Better illumination methods can be used to recognize gestures in better manner.

Interactive Manipulation of 3D objects using Kinect for Visualization Tools in Education

In this paper, author used Kinect Sensor, C#, Emgu CV 2.3.0 Library to control presentations used in education system. Gesture set is defined to control presentation and its slide show. This interactive manipulative system is replacing the mouse as it allow to control the interface through gestures. User is no more bound with devices to operate, it can be done through gestures.

Shortcomings are:

1. Restricted to very ambient conditions.
2. Failures can occur due to unexpected hand state change and incorrect gestures.

Future Work:

1. Can enhance the recognition rate of the hand gesture.
2. Can be applied to various domains like military, medical operations.

A Simple Wearable Hand Gesture Recognition Device using iMEMS

In this paper, author used accelerometer, microcontroller and wireless transmitter and receiver (XBEE) to generate gestures to control interface. In this paper commands to

computer system are given through the commands. It can support the interaction with three dimensional objects on screen. It can also support teaching task, physically disable people. It can replace mouse with more convenient and intelligent interface.

Shortcomings are:

1. Signal noise cause the problem in gesture recognition.
2. During data transmission, data is in form of packets which can be lost because of dis-connectivity with server if happen.

Future Work:

1. Portability can be improved.
2. Size can be reduced by using smaller IC's chips.

Enchantment under the sea: An intelligent environment for user friendly music mixing

In this paper, author used Hidden Markov model with various sensors through which on dynamic choices and demands provided by the user DJ can play the songs without staying bound with the system, he can also be a part of audience to experience the same and also perform his task of mixing and playing of songs. Better environment is provided for both Dj and public even there is more transparency to the Dj work. Public is also equally involved.

Shortcomings are:

1. Controller is viewing sea figures which create confusion and divert the attention.
2. Participants felt stressed while using it.

Future Work:

1. Efficiency can be improved.
2. Choice of figures can be provided to individual users as per the choice.

Vision- based Multimodal Human Computer Interface based on parallel tracking of eye and hand motion

In this paper, vision based multi-model technique is used to track the gestures based on eye and hand posture. For eye and hand detection skin color is used and it's even robust to light variations. Interaction is done with the eye and hand gestures.

Shortcomings are:

1. Recognition is effected with light variations.
2. Difficult to operate in such environment and even its difficult to operate in such environment.

Future Work:

1. Can be implemented using facial recognition.
2. Lightening effects can be reduced using different approaches.

Design of interactive whiteboard system for collaborative Learning

In this paper, author designed white interactive board for collaborative learning which is operated with the laser to give commands or to perform operations. Students/user can explore the data to topics through collaborative activities can be used for academics, meetings, brainstorming sessions.

Shortcomings are:

1. Performance and accuracy is not up to the mark.
2. It's difficult to understand and operate such system.
3. Training sessions are required to operate.

Future Work:

1. Can be tested in various learning environments.
2. Accuracy and performance can be improved.

UBiRO: An Interactive device supporting Object Registration and recognition of the service robot

In this paper, author used UBiRO software is used with IEEE 1394 camera to recognize objects and register them. With the help of this camera recognition can be done easily of indoor objects and their effective classification is also possible manipulation can be done easily. Hardware objects are scanned and identified for controlling mouse.

Shortcomings are:

1. To perform double click need to fix the mouse pointer at least for 300ms when click is performed.
2. Varying lightening conditions and different view-points can cause problem careful management is required for UbiRo.
3. Difficult to operate as not having desk-pad to operate properly.

Future Work:

1. Can work on out-door localizing system.
2. More effective algorithms can be used.

Design of interactive user interface with Integration of Dynamic Gesture and Handwritten Numeral Recognition

In this paper, author used Kinect sensor and BPNN (back propagation neural network).hand written numeral are used to control various devices like TV. These numerals are recognized with the help of Kinect Sensor.Recognition rate ofdynamic gestures andhandwriting recognition system is 90%.Average time ofrecognition is notexceeding 30ms. User experiences real-time interaction.Brings the revolution intraditional TV system.

Shortcomings are:

1. Uses skeletonjoints donewith buttonclick notpossible for physicaldisablepeople.

Future Work:

1. Time can be reduced.
2. Accuracy level or gesture recognition can be improved.

Natural Interactive 3D Medical Image Viewer Based on Finger and Arm Gestures

In this paper, author used Kinect sensor SDK 1.6 with C#.net. Author used C++ with VTK to design medical interface which is controlled by gestures given by the user through Kinect to operate by recognizing those gestures. Average time to complete the task is 2.25. Accuracy of gesture recognition on average bases is 93%. Gestures are controlled and managed easily as they are less in numbers.

Shortcomings are:

1. Average time can be reduced.
2. Accuracy can be improved.
3. Number of gestures are less, scan be extended.
4. Participant is using single arm both can be used.

Future Work:

Time, accuracy, increase in number of gestures are the domains which can be used for future work.

Advanced Mouse Pointer Control Using Trajectory Based Gesture Recognition

In this paper, author used visual studio 2008 with OpenCV to develop a method to control the movement of mouse pointer using had gestures captured with the help of webcam. Motion is captured and then scaled as per the requirement and used as gestures. Trajectory based gesture recognition is fast. System is reliable in real time and can also be used for

other multimedia applications.

Shortcomings are:

1. Average time can be reduced.
2. Accuracy level is not up to the mark.
3. Lk method is slower than MHI (motion history of the images) i.e. still improvement is required.
4. Suitable only for real time applications.

Future Work:

1. Algorithm can be improved.
2. More gestures can be introduced.

Diagrammatic representation of the Literature Review

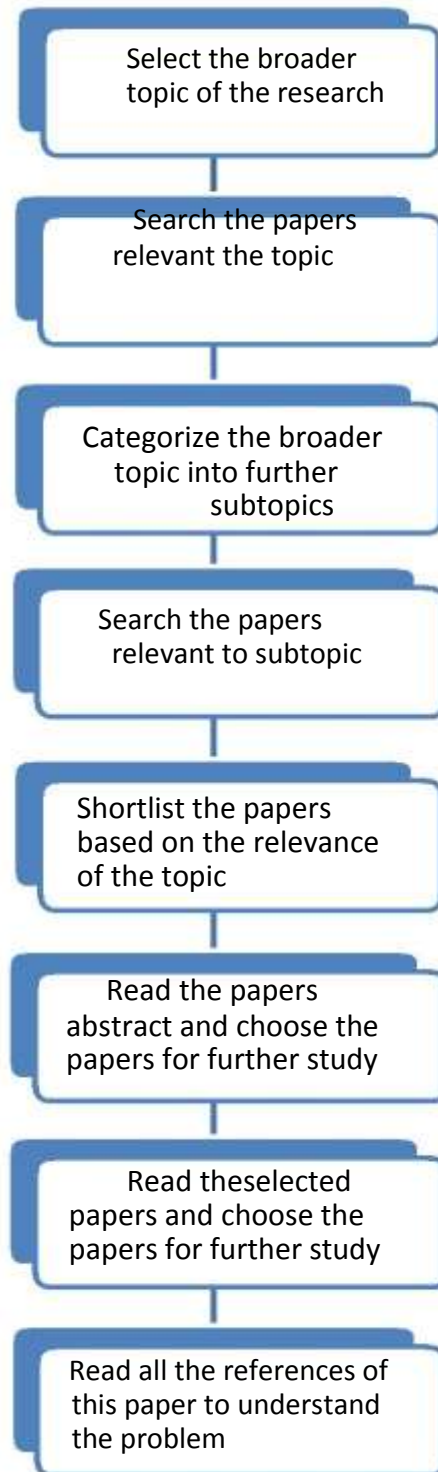


Figure 4 diagram of Literature Review

CHAPTER -3

PRESENT WORK

Human computer interaction is no more bound through the devices only. With the advancement of techniques user is no more bound to the devices and user can operate it through the various gestures recognition techniques. Kinect V2 device is used here to operate ums interface to perform login and attendance part with the help of Kinect V2. Kinect V2 is the Microsoft device specially made for gaming purpose which was launched on June 2011. Kinect V2 is a motion sensing input device which is capable for recording the videos that is utilized for the gesture recognition process. It allow users to interact or control console or computer system without the need of any traditional controller through natural user interface using gesture or spoken commands.

Microsoft release software development kit(SDK) for the developers to develop apps. Kinect V2 is horizontal bar connected to small base. It is containing RGB camera, depth sensor and multi-array microphones which is capable to recognize three dimensional motion captures, facial recognition and voice recognition also. Depth sensor camera is consisting of an infrared laser project i.e. combined with CMOS sensor i.e. capable to capture video data in three dimensional under ambient lightening conditions.

Kinect V2 support gesture recognition, facial recognition as well as voice recognition. Kinect V2 can track at the max six people in single attempt. It allows two active participants for playing as it can analysis motion of two players. It can detect 20 joints per person.



Figure 5 Kinect V2

Requirements of Kinect V2 are:

System Software and application software requirement:

1. Windows 7 or Windows 8 (Operating System).
2. Windows 8 (x64).
3. Visual Studio 2012 or 2013.

Hardware requirement:

1. 64 bit (x64) processor.
2. 4 GB memory.
3. Built-in USB 3.0 Host controller.
4. DX11 Graphic adapter
5. A kinect V2 sensor

3.1 OBJECTIVE OF THE STUDY

The objective of the study is to control the mouse pointer through the gestures given through the images or videos after recognizing them corresponding actions or clicks will be performed. User will not be restricted with the devices he/she can control it through the gestures from faraway location; it can also assist physical disabled people in the interaction with the traditional system. Kinect V2 is a motion controlling device which is used here to capture the videos and convert those image frames into gestures as per the defined actions. Kinect is a combination of RGB camera, depth sensor and multi-tracking microphones which can recognize six users at a time, joint detection can be performed easily by two users.

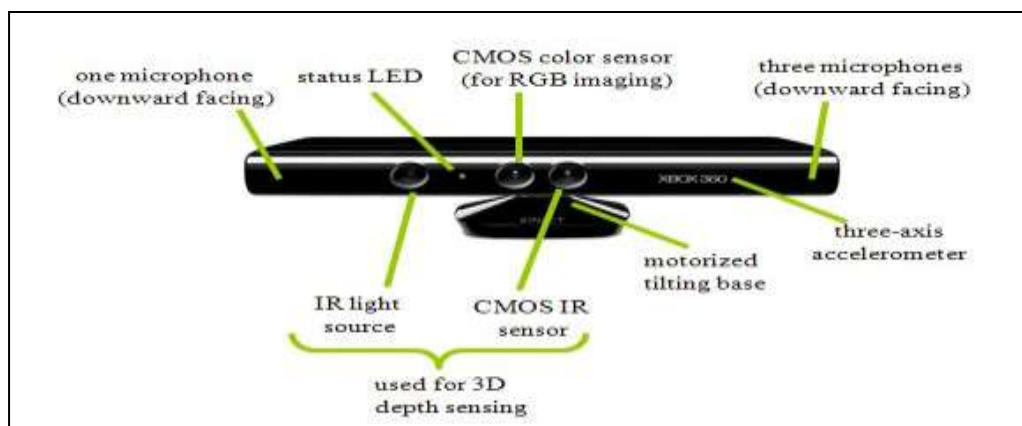


Figure 6 Kinect V2 and its various components

Kinect V2 is used to capture colored videos of which frames are used to perform gesture recognition to operate user interface.

3.2 RESEARCH METHODOLOGY

Visual studio 2012 is used to design UMS interface to perform login and to take attendance which is controlled by gestures given by the user dynamically which are predefined or stored in the code which is designed in C# using Visual Studio 2012. Colored video is recorded with the help of Kinect V2 which used given to the system in the form of frames which are assisted with various Kinect predefined libraries and references. Console or computer interface is operated with the help of gestures. Gestures set is defined directly for interface as well as for mouse pointer also.

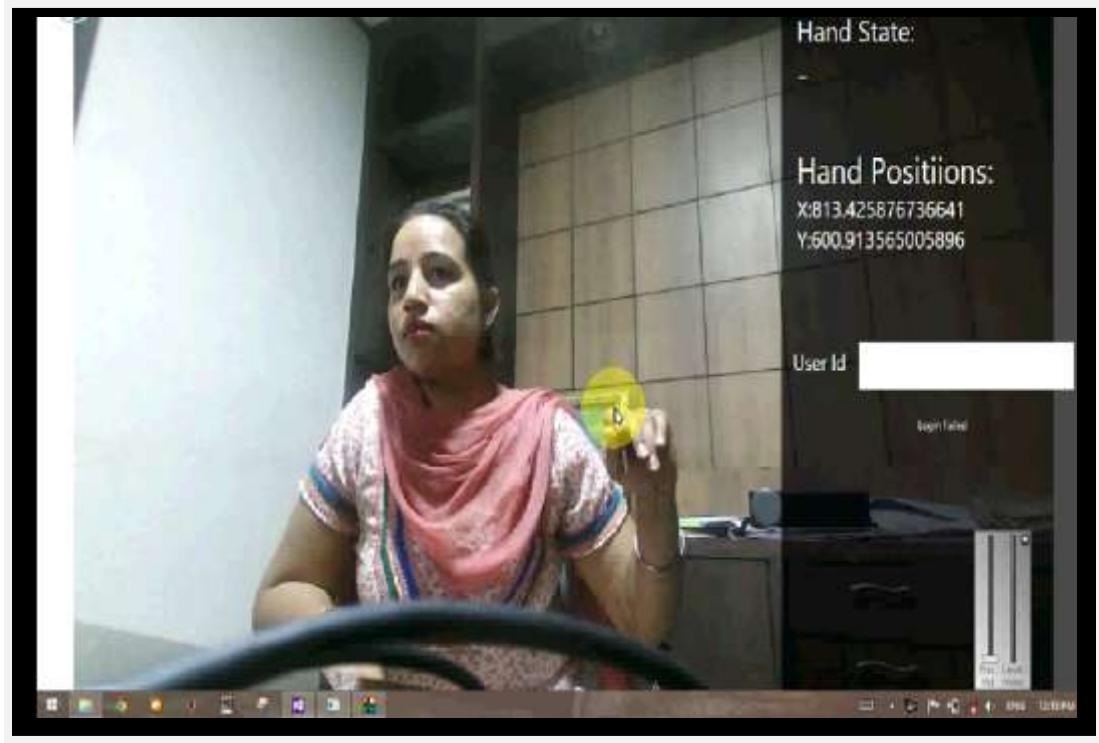


Figure 7 interface interaction through pointer

mouse pointer can be recognized there as a circle. It has two partitions one is containing the colored captured view through kinect and the second part is containing the interface which

will be operated through the gestures controlled through the code and operate interface as per that.



Figure 8 interface login through left gesture

User id is filled with the help of keyboard and gesture is defined as a password here. Right hand above head is the gesture defined as a password for login, if gesture various login will not be performed. Hand should be above head position as both are detected by the system (head position as well as right hand position).



Figure 9 controlling mouse pointer using left and right gesture

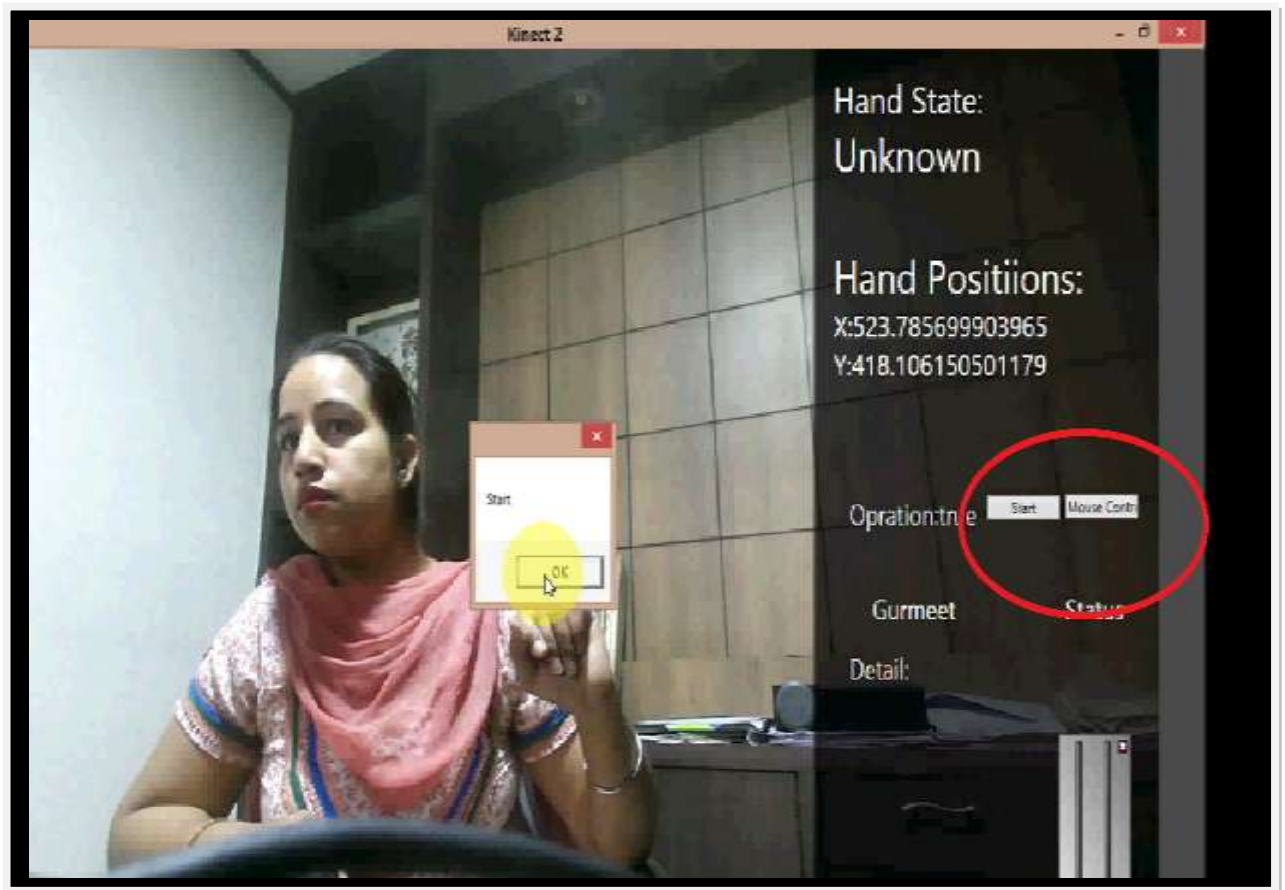


Figure 10 interface initiated

User can operate as per the choice either through mouse control or through direct gestures to operate interface. Gestures are defined for attendance part, if reflected student is present right hand should be raised above the head if right hand is below head position gesture will not be recognized. If reflected student name is absent then left hand should be raised above the head position that will mark absent there.

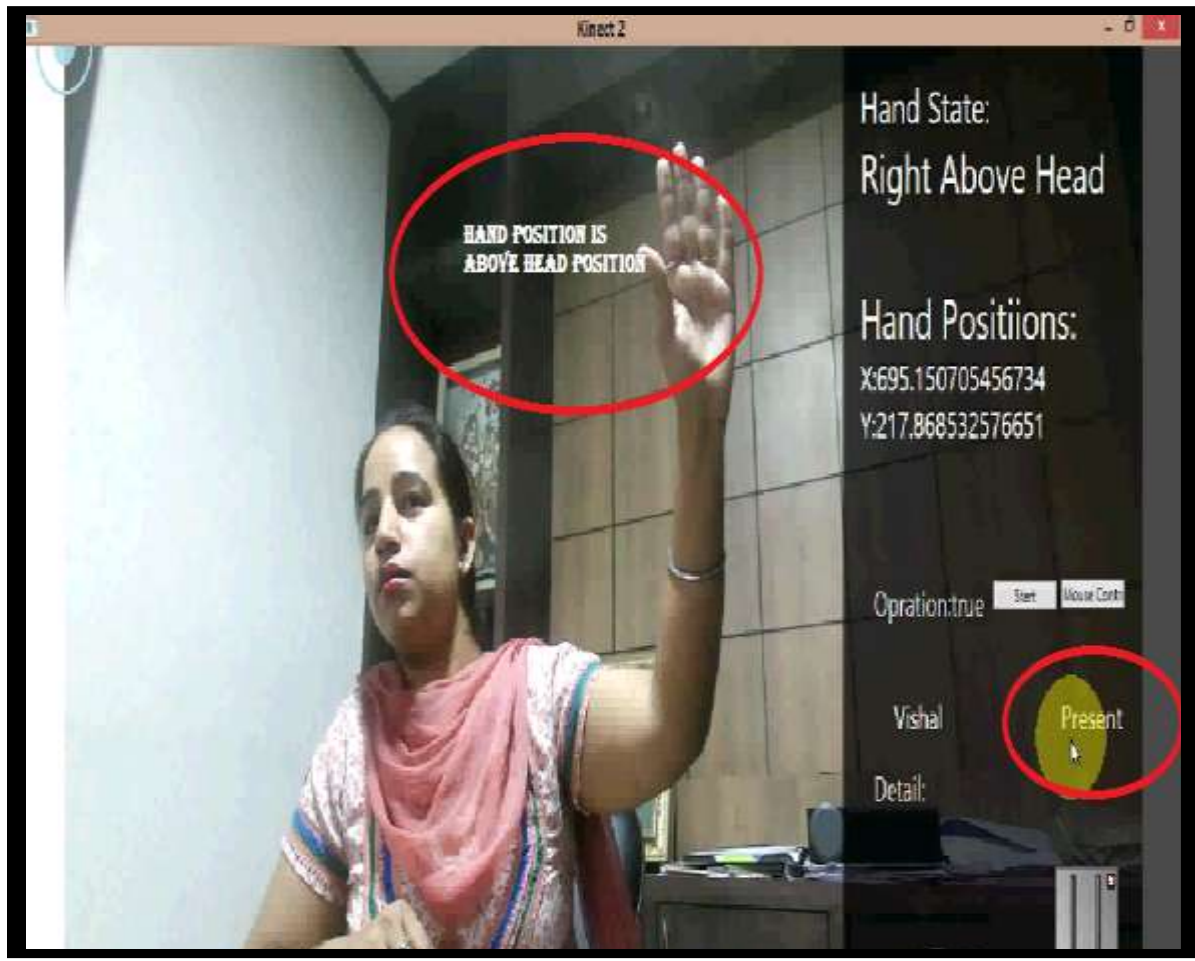


Figure 11 Attendance Interface controlled through left and right Gesture

User can control mouse with the help of gestures also. Right hand gestures are used to change or move the mouse pointer and left hand gesture is used to perform click. Gestures are only controlling the moving part of the mouse and selection through the click with the right hand gesture to perform left click of mouse.



Figure 12 moving mouse pointer using right hand gesture



Figure 13



Figure 14 mouse click performed using left hand gesture

User performed here click through left hand gesture where right hand gesture define the position of the mouse.

CHAPTER – 4

RESULTS AND DISCUSSIONS

As per literature survey gesture recognition used for the convenience of the user but it's hardware and software requirements are feasible for every normal system. Requirements are quite high comparatively. Interface is operated through the gestures captured through kinect V2 and concerned actions are performed. Gestures are operating interface which is controlling the login of the user as well as the attendance part that is done in the universities or in colleges and schools still manually or through the input devices. With the help of this system user or faculty is no more bound with the system. He/ she can take the attendance while standing at faraway place.

Gestures used to operate this interface are given below in this table:

Sr. No.	Gesture	Interface based Action	Mouse control
1	Left hand	Absent marked	Click
2	Right hand	Present marked	Mouse movement

Table 3 gesture used for interface n their functioning

Login and attendance interface can be controlled by click or by gestures also. Login interface is having user id and password. User Id is filling manually by the user whereas for password is gestures defined. Left hand gesture is controlling the password. Interface will you to login if left hand gesture is given Acceptance of left hand gestures is based on the head position. Left hand position should be above head position only then it will be accepted. Login interface is started manually, then choice is done between either to operate interface through only gestures or by controlling mouse pointer using gestures.

Attendance interface is operated through the above choices. Attendance interface is containing the name of the student and the status of the student. Names will be displayed their one by one and their status will be changed with the help of gestures. If student is currently present in the class user (teacher) will raise right hand above the head position that is the condition to capture the gesture but if student is not present in the class then left hand will be used for gesture and again it should be above head position. To control console or interface through mouse , mouse click option should be manually and then right hand will be used for moving mouse pointer and left hand will be used for click part. Selection, single or left click of mouse will be performed with the left hand gesture.

CHAPTER – 5

CONCLUSIONS & FUTURE SCOPE

Gesture recognition is the process through which images and videos are used to collect gestures and perform corresponding actions based on controlling mouse pointer. Gesture recognition is the domain which is increasing its area day by day. It can be utilized in every field as computer system is part of every system because of its convergence with other technologies. Gesture recognition is the process through which user interface can be controlled with the help of defined gestures. As mouse is the pointing device to operate the graphical user interface but with the advancement we can operate the console or interface without using traditional devices. User login and attendance is controlled and operated by gestures performed by hand gestures. To use this system efficiently, hardware and software requirements should be satisfied. In this system only hand gestures are used. Left and right hand gestures are used to operate interface. Mouse is also performing single click with the help of gestures.

FUTURE WORK

It can be used in other domains like information exploring on airports, railways, hospitals etc. Gesture set can be extended as having less number of gestures. Performance can be improved by using better resources as are quite expensive. Only hand gestures are used here, facial and body postures can also be used as future work. In this system future work can be based on either on domains or on algorithms.

Based on domain

1. It can be utilized on Airports, Railways Reservation system to explore information or for the reservation purpose.
2. It can be used in malls, shopping marts and plazas to try new cloths, accessories, footwear's without wearing them.
3. Can be used in universities or campus to explore information, virtually viewing

campus.

4. Finger, body and facial recognition techniques can be used.
5. With the change in hardware speed & performance can be improved.
6. Different platforms can be used as its implemented with C#, matlab or OpenCv can be used.
7. Different algorithms can be used based on different techniques.

CHAPTER – 6

REFERENCES

6.1 Research Papers

[P1] De Silva.et.al, “Human Factors Evaluation of a Vision- Based Facial Gesture Interface” IEEE(2003).

[P2] Sohn &Lee, “UbiRO: An Interactive device supporting Object Registration and recognition of service robots”, IEEE (2006).

[P3] Shin & Chun,” Vision Based Multimodal Human Computer Interface based on Parallel Tracking of Eye and Hand Motion”, IEEE (2007).

[P4] Pandit.et.al, “A Simple Wearable Hand Gesture Recognition Device Using iMEMS”, IEEE(2009).

[P5] | Manchanda & Bing, “Advanced Mouse Pointer Control Using Trajectory Based Gesture Reconition”, IEEE (2010).

[P6] Jamshid Dastur, Dr.AttahullahKhawaja, “Robotic Arm Actuation with 7DOF USING HAAR Classifier Gesture Recognition”, IEEE (2010).

[P7] | Dardas & Alhaj, “Hand Gesture Interaction with a 3D Virtual Environment”,
ISSN(2011).

[P8] Ruiz.et.al, “User defined Motion Gestures for Mobile Interaction”, IJSR (2011).

[P9] Aziz.et.al,” Implementation of an efficient algorithm for Human Hand Gesture Recognition, IEEE (2011).

[P10] Chavez.et.al,” Enchantment under the sea: An intelligent environment for user friendly music mixing”, IEEE (2012)

[P11] Xu.et.al, “MEMS Accelerometer Based Nonspecific – User Hand Gesture Recognition”, IEEE JOURNAL (2012).

[P12] Kaura.et.al, “Gesture Controlled Robot using Image Processing”, IJARAI (2013)

[P13] Linsie & Arkarsi, “Hand Gesture recognition using MEMS for specially challenged People”, Vol-4, Issue 02, ISSN (2013).

[P14]] Tantakurn.et.al, “Natural Interactive 3D Medical Image Viewer Based on Finger and Arm Gestures”, IEEE (2013).

[P15] Lee.et.al, “Interactive Manipulation of 3D objects using Kinect for Visualization Tools in Education”, ICCAS (2013).

[P16] Hachaj & Ogiela, “Rule Approach to recognize Human Body poses and gestures in real time”, Multimedia Systems, 20:81-99, Springer (2013).

[P17] Sheu.et.al, “Design of interactive user interface with Integration of Dynamic Gesture and handwritten Numeral Recognition”, IEEE(2014).

[P18] Madni.et.al, “Design of Interface Whiteboard System for Collaborative Learning”,IEEE (2014).

[P19] Shyam Golkotta, “Bringing Gesture Recognition to all Device’s” IJSR (2014)

6.2 Websites

- [1] http://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

- [2] http://en.wikipedia.org/wiki/Gesture_recognition

- [3] http://en.wikipedia.org/wiki/Category:History_of_human%E2%80%93computer_interaction

- [4] <http://www.itmindia.edu/images/ITM/pdf/Gesture%20Recognition%20Technology.pdf>

- [5] https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCwQFjAA&url=http%3A%2F%2Fwww.ics.forth.gr%2F_publications%2F2009_06_book_hci_gestures.pdf&ei=k5deU5vQFoGmrQfEwIH4BQ&usg=AQjCNG3FfZWq_ebELMxUPpcj2rIMbDxZQ

- [6] IEEE transactions on cybernetics

- [7] IEEE international symposium on robot and human interactive communication

- [8] International journal of artificial intelligence and applications

6.3 APPENDIX

<u>TERM</u>	<u>FULL FORM</u>
1. APM	- Appearance based Model
2. ASL	- American Sign Language
3. DAC	- Depth Aware Cameras.
4. DOF	- Degree of freedom
5. GUI	- Graphical User Interface.
6. GR	- Gesture Recognition
7. HCI	- Human computer Interaction
8. HML	- Hidden Markov Model
9. HMI	- Human Machine Interaction
10. IC	- Integrated Circuits
11. MEMS	- Movement and motion scanners
12. MHI	- Motion history of the images
13. OPENCV	- Open source computer vision
14. SDK	- Software Development Kit
15. VTK	- Visualization Toolkit Library

