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Virtual Paint And Volume Control Using Hand Gesture

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ABSTRACT:

In Software's we use for painting traditionally available with devices which are used to point like keyboard, mouse. They have certain advantages and disadvantages whereas beyond that they also have limitations which cannot be stated as disadvantages. Basically we are focusing on covering more users under same software used by users in efficient manner. As we are pointing using hand gestures it have some uniqueness and it increases user friendliness of the software which we are developing. Using hand gestures and volume control for virtual paint associated with different actions it will draw different shapes on paint screen. This system only needs camera of laptop or webcam and hand gestures and for detecting the images opencv is used and the gesture recognition is done by the MediaPipe.

Gesture recognition is an emerging technology field. We create a natural user interface for interacting with MSPAINT on windows machine input will be hand gestures of user which will be processed using camera for issuing a command to MSPAINT application. The paint application becomes virtual because the drawing happens in air through gestures and volume control. The virtual paint screen is made by help of UI. Web camera is used to extract the gestures of hand in order to achieve fast and stable gesture recognition in real time without any distance restrictions.

INTRODUCTION:

Most of the people are familiar with various painting software. In the digital social media where photos or images got much importance, the need of a user
friendly painting software is essential. The traditional painting software require a hardware pointing devices or a touch sensitive screen for interaction. In most cases we need a hardware medium for interacting with the software system.

Direct use of hands as an input device is an attractive method for providing natural human - computer interaction which has evolved from text based interfaces through graphical based interfaces. Gesture recognition can be seen as a way for computers to begin understanding human body language, thus building a richer bridge between machines and humans. It will be more user friendly if the computer system can be controlled using hand gestures

Method	Accuracy
Glove Based Approach	74%
Computer vision Approach	89%
Machine learning Approach	96%

LITERATURE SURVEY

Following project shows a survey of different proposed hand gesture and computer based

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approaches to eliminate hardware interfaces that costs less. Paint Using Hand Gesture: Machine Learning Approach , they discussed about gesture based paint tool box which has 6 gestures to draw line, draw circle. This paper states various approaches through which a paint tool box accuracy can be achieved. To achieve more accuracy than any other approach they have used machine learning approach. According to the survey Machine learning approach gives 96% accurate result. They have Haar-Like classifier which is used to track the hands and they have also used edge detection for calculating threshold value of the object which is in front of the camera. They implement this by using simple hand gestures and web cam of laptop or desktop. Haar-Like classifier used to compare the image which is captured to the gesture present in current dataset , if matched resulted action performed on the screen. Isolated hand are captured and classifier used to separate them with background image and other body parts. For color selection they have used some conversion method which is Gray conversion if selected color is in Black and White or in RGB color form, for color selection they have used disjointing the color set used to analyze the color and draw colored shaped object. Gloved and Free Hand Tracking based Hand Gesture Recognition , they discussed about continuous hand gesture recognition. It reports the robust and efficient hand tracking as well as segmentation algorithm where a new method, based on wearing glove on hand is utilized. We have focused on another tracking algorithm, which is based on the skin color of the palm part of the hand i.e. free hand tracking. A comparative study between the two tracking methods is presented in this paper. A fingertip can be segmented for the proper tracking in spite of full hand part.Wavinggoodbye is a gesture. Pressing the key on a keyboard is not the gesture because the motion of a finger on its way to hit in a key is neither observed nor significant. So the gloved hand is tracked and the value stored is active to recognition. According to glove based recognition technique it is easy to find color selection by identifying the color of the glove wearied by user. Free hand tracking reduces the cost estimation of time and space of the algorithm. Low cost approach for Real Time Sign Language Recognition , they discussed to overcome this problem technology can act as an intermediate flexible medium for speech impaired people to communicate amongst themselves and with other individuals as well as to enhance their level of learning / education. The objective of this research is to identify a low cost, affordable method that can facilitate hearing and speech impaired people to communicate with the world in more comfortable way where they can easily get what they need from society and also can contribute to the well-being of the society. Another expectation is to use the research outcome as learning tool of sign language where learners can practice signs. In this paper Sign Language Recognition is done and then Contour matching is performed. As soon as contour is matched the recognition is completed. Here moments and YCrCb color space is part of contour matching. This project has wide scope in terms of words and phrases which can be formed by action and captured by action as set of actions.By applying machine learning algorithm with state machine in intelligent sign language recognition system.

Human Computer Interaction Using Face and Gesture Recognition , they discussed and present a face and gesture recognition based human-computer interaction (HCI) system using a single video camera. Different from the conventional communication methods between users and machines, they combine head pose and hand gesture to control the equipment. They can identify the position of the eyes and mouth, and use the facial center to estimate the pose of the head. Two new methods are presented: automatic gesture area segmentation and orientation normalization of the hand gesture. It is notmandatory for a user to keep gestures in upright position, the system segments and normalizes the gestures automatically. The user can control multiple devices, including robots simultaneously through wireless network. Hand Gesture Recognition for Indian Sign Language , they discussed about

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hand gesture recognition system to recognize the alphabets of Indian Sign Language. Cam shift method and Hue, Saturation, Intensity (HSV) color model are used for hand tracking and segmentation. For gesture recognition, Genetic Algorithm is used. We propose the easy- to-use and inexpensive approach to recognize single handed as well as double handed gestures accurately. This system can definitely help millions of deaf people to communicate with the other normal people. This system consist of life cycle for tracking gestures HandTracking,Segmentation, Feature Extraction, Gesture Recognition. For object tracking they have studied point tracking, kernel tracking, silhouette tracking. According to that study used
Camshift Method gives more accurate result. Real Time Sign Language Recognition using consumer depth camera , they discussed about recognition of different hand gestures for 24 alphabetic letters. For classification purpose they have used multi- layered random forest (MLRF). This reduces training time and memory consumption which reduces forest automatically in very short time a
home computers. Used MLRF technique is potentially high accurate and takes very short time for training and memory. Feature Extraction process involves
digital image processing, ESF descriptor which used to detect hand and it consist of histogram sets which are combined. Histogram describe the distributions of the distance between two random points in point cloud. MLRF method has
random forest, clustering the data, Training and Evaluation of that data. Clustering of the data compute the features at a given aggregation level; create artificial cluster which consist of data and sampled data. According to calculation differentiate the clustered data and the forest. Evolution differentiate the data in synthetic and real classification which consist of different gestures associated with their signs which is captured using depth camera, real data hasdataset of 24 static signs derived from American Sign Language(ASL). Vision Based Hand Gesture Recognition , they discussed about glove based hand recognition through a wearable glove called as cumbersome glove-like device which has sensors used to sense the movements of hands and fingers. Collected data through sensors is then send to the computer. This approach has high
accuracy and fast reaction speed but data gloves which are used are very expensive. It costs around $12,500 which is as much as high configured supercomputer. Through this technology 85% accuracy can be achieved.
Another mentioned approach is color glove based approach which combines glove based and vision based approach. But color glove based approach has certain limitation such as shades of that color, Camera which is used to capture those gestures. Life cycle of the project is Capture the image Detection and Segmentation, Tracking of hands, Interpreting hand gestures and application.
Detection involves skin color, shape, Background Subtraction. Tracking of hands uses optical flow and Camshift method. It uses Tracking-Learning- Detection with these three methods it tracks and binds the gestures. For classification they have used Hidden Markov Model and Finite State machine. Vision based approach gives high accuracy and has better result produced but as it is based on glove based approach it becomes expensive even it is easy to handle and operate. The Vision-Based Hand Gesture Recognition Using Blob Analysis , this paper discussed about Human Computer Interaction and hand gesture classification captured through contact-based and vision-based devices. For classifying the gestures they have used Blob Analysis method. For contact based devices user require to wear external hardware while vision based devices not require any external hardware support. They also studied problem regarding skin color recognition process depending on illumination changes. To recognize the gesture they have used hidden markov model and Dynamic Time Wrapping
and Support Vector machine. Fundamental studies which learned from this paper is Multi Object tracking which defined as locating moving object using featureextraction algorithm which includes feature vector, SIFT, Particle Filter, Kalman Filter and Optical Flow. Optical

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Flow defined as technique, which is used to detect moving objects within image. There are certain changes related to background because use of different differential equation which applied between frames in detection problem. Proposed method in this paper follow procedure as

Video Acquisition and distribute them into frames, Image capturing and separation conversion from RGB to grayscale conversion, Mean calculation. Blob analysis is used to calculate statics of labeled region. This paper proposes

an alternative idea for contact based device hand recognition, which is less expensive and as accurate as Contact based technology. Paint using Hand

Gesture Recognition for Human Computer Interaction , this paper discussed about hand gesture recognition and its wide scope of controlling systems in all fields. Hand Gestures can be used to replace traditional pointing devices such as mouse and keyboards. They proposed a system for desktop application, which is implemented by using OpenCV library in C++. In this system Depth Segmentation and Hand Color Model used for detecting hands. After they have configured palm and hand as separate, detection technique according to the gestures will be varied. The Senz 3d camera captures a RGB video frame and associated depth data and threshold value of that data is calculated data to

remove background. To find convexity defect they have used y=mx+c equation

of slope. Static Regression Rate when there is no or small relative motion between camera and the hand and Dynamic Recognition Rate. Result of the system developed are result are accurate as compared to previous systems. Capturing speed increased and processing time is reduced. The proposed method is able to perform in real time at 30 frames per second, achieving high recognition rate while utilizing minimal processing power. This system can be extend to improve accuracy of hand detection, increasing its range and performing real time capturing. Also we can implement this system in 3 dimensional pose estimation of hands where more graphical view can be plottedon system with robust fingertips tracking. Hand Gesture Recognition Using Different Algorithms Based on Artificial Neural Network [10], this paper

discussed about edge detection and skin detection algorithm with their

differences. According to discussion edge detection algorithm working is capture the video and convert them into frames to convert grayscale which helps to plot histogram which helps for edge detection of hand. Fill image implement that drawing shape with boundary of that shape. For capturing the edges and

borders of the diagram vectorization is used. After that fingerprint tracking is done for gesture identification defined in dataset which is displayed in system output. For above process they have used webcam as camera module. Another defined algorithm used is skin detection which is used for detection of hands using camera module. Video Capture is first stage which is then it is converted frames with rate at 30 FPS. Instead of edge detection here skin detection is used, with their boundary detection stored in vector and fingerprint tracking with this gesture detection using defined dataset and drawn shape is drawn on system output.

ARCHITECTURE: -

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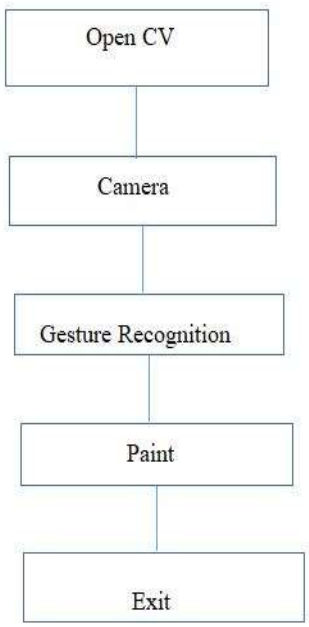

Fig - Architecture Diagram

EXISTING SYSTEM

Most of the people are familiar with various painting software. In the digital social media where photos or images got much importance, the need of a user friendly painting software is essential. The traditional painting software require a hardware pointing devices or a touch sensitive screen for interaction. In most cases we need a hardware medium for interacting with the software system. Direct use of hands as an input device is an attractive method for providing
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understanding human body language, thus building a richer bridge between machines and humans. It will be more user friendly if the computer system can be controlled using hand gestures.

PROPOSED SYSTEM

In the Proposed System we have used the technologies such as opencv and mediapipe. Hand gesture recognition can also be used for applications like industrial robot control, sign language translation, in the rehabilitation device for people with upper extremity physical impairments etc. Hand gesture recognition finds applications in varied domains including virtual environments, smart surveillance, sign language translation, medical systems etc.

METHODOLOGY :

Hand gesture recognition and tracking are handled by the MediaPipe framework, while computer vision is handled by the OpenCV library. To track and recognize hand movements and hand tips, the program makes use of machine learning ideas.

3.1 MediaPipe

MediaPipe is a Google open-source framework that was initially released in 2019. MediaPipe has some built-in computer vision and machine learning capabilities. A machine learning inference pipeline is implemented using
MediaPipe. ML inference is the process of running real data points. The MediaPipe framework is used to solve AI challenges that mostly include video and audio streaming.
MediaPipe is multimodal and platform independent. As a result, cross-platform apps are created using the framework.
Face detection, multi-hand tracking, hair segmentation, object detection, and tracking are just a few of the applications that MediaPipe has to offer. MediaPipe is a framework with a high level of fidelity. Low latency performance is provided through the MediaPipe framework. It's in charge of synchronizing time-series data. The MediaPipe framework has been used to design and analyze systems using graphs, as well as to develop systems for application purposes. In the pipeline configuration, all of the system's steps are carried out. The pipeline that was
designed can run on a variety of platforms and can scale across desktops and mobile devices. Performance evaluation, sensor data retrieval, and a collection of components are all part of the MediaPipe framework. Calculators are the parts of the system. The MediaPipe framework uses a single-shot detector model for real-time detection and recognition of a hand or palm. It is first trained for the palm detection model in

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the hand detection module since palms are easier to train.

FLOW CHART:

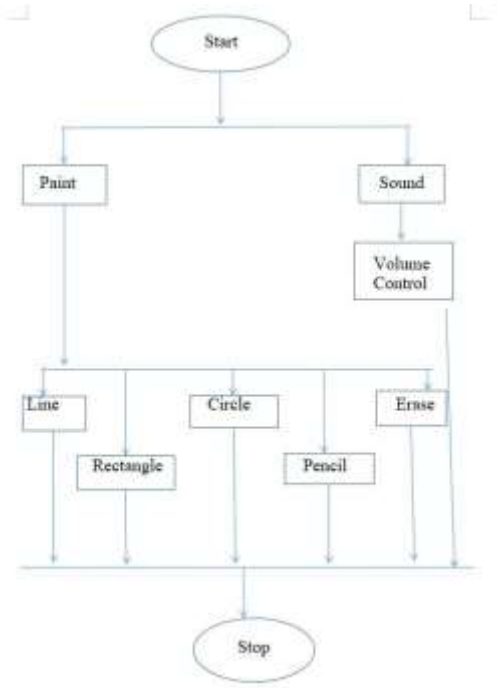

Fig: Flowchart of Virtual paint and Volume Control

RESULT:

In this machine learning application, we have developed code by using Python programming language along with OpenCV library. Main idea behind this algorithm is to use live feed from camera and process each frame. However, the algorithms will be implemented on defined ROI (region of interest).

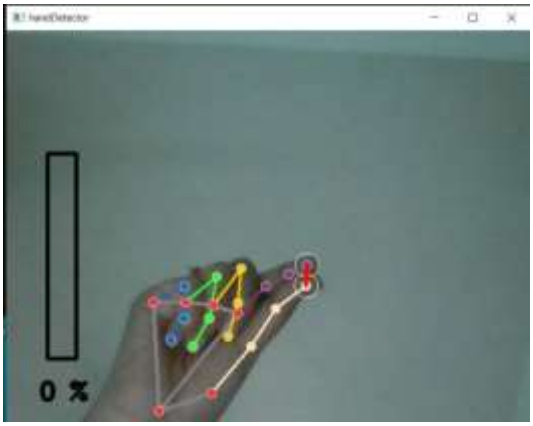

Fig: Volume control

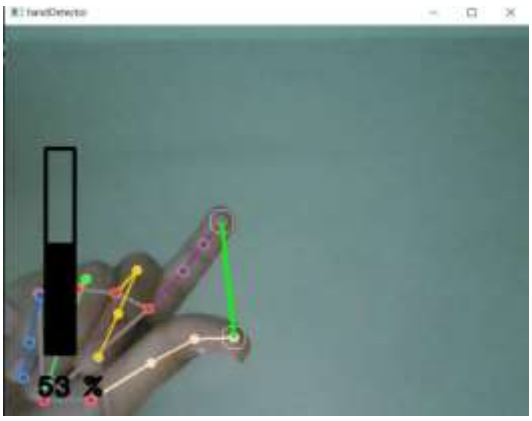

Fig: Volume control

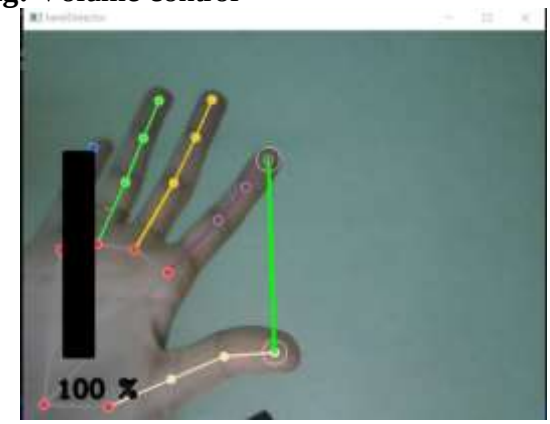

Fig: Volume control

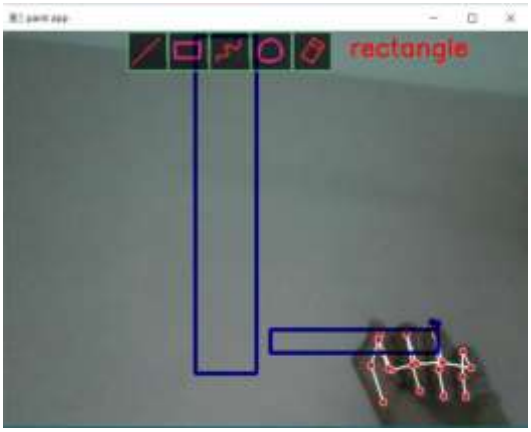

Fig: Virtual Paint Using Hand Gesture

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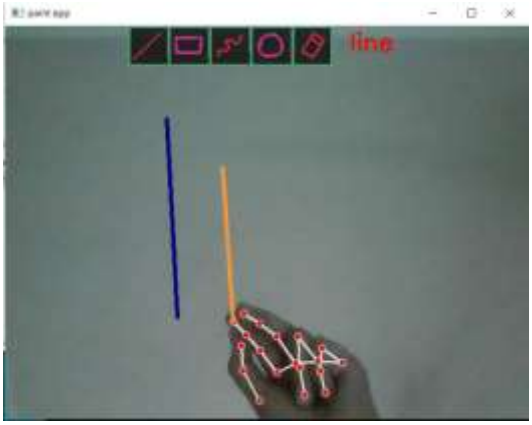

Fig: Virtual Paint Using Hand Gesture

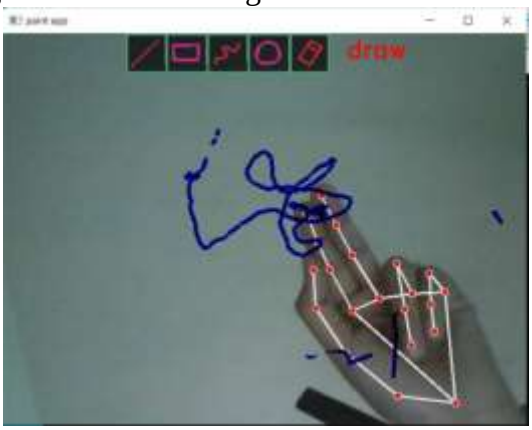

Fig: Virtual Paint Using Hand Gesture

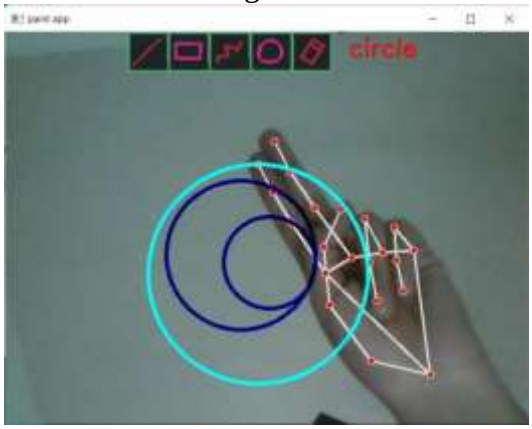

Fig: Virtual Paint Using Hand Gesture

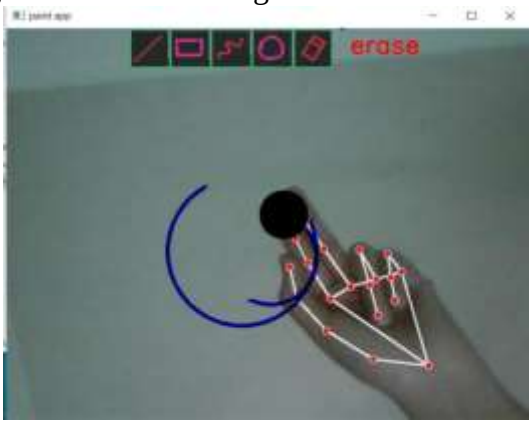

Fig: Virtual Paint Using Hand Gesture

CONCLUSION

The project presented a program that allowed user to perform hand gestures for easy software control. A vision-based hand Gesture system that does not require any special markers or gloves and can operate in real-time on a commodity PC with low-cost cameras. Specifically, the system can track the tip positions of the counters and index finger for each hand. The motivation for this hand Gesture was a desktop-based volume control system in which a user can control volume and cursor navigation in realtime using natural hand motions.

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