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AIR CANVAS APPLICATION USING OPENCV

Prof. Heena Patil[1] , Anurita Bose [2], Deep Ghodekar[3] , Priyanshu Kannaujiya[4], Ridhesh Tare[5]

[1]Head of Department, Dept. of AIML Diploma, ARMIET, Maharashtra, India
[2]Student, Dept. of AIML Diploma, ARMIET, Maharashtra, India
[3]Student, Dept. of AIML Diploma, ARMIET, Maharashtra, India
4Student, Dept. of AIML Diploma, ARMIET, Maharashtra, India
[5]Student, Dept. of AIML Diploma, ARMIET, Maharashtra, India

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Abstract -*A creative and dynamic project called "Air Canvas Application" makes use of OpenCV (Open Source Computer Vision Library) to harness the power of computer vision to create a virtual canvas in the air. This Without requiring actual sketching utensils or paper, users of this cutting-edge app can paint, draw, and work on a virtual canvas simply by waving their hands in the air.This project's main objective is to follow a user's hand or pointing device movement and convert it into digital drawings on a computer screen by utilizing OpenCV's capabilities. The project's goal is to provide a distinct and engaging drawing experience without requiring physical contact or specific equipment like graphics tablets. We've combined We integrated numerous hand features into our project to improve both its usability and functionality. With this feature, our system will be able to identify and react to a wider range of hand motions and interactions, giving users more natural control and interaction possibilities..*

Key words: *Air Canvas Application, Computer vision , Virtual canvas, Hand gestures ,open cv*

1.INTRODUCTION

Innovative and imaginative apps that connect the dots between technology and art are becoming more and more popular in our rapidly changing digital world. One such effort is Air Canvas, which uses OpenCV in particular to harness the power of computer vision to build a distinctive and dynamic digital painting platform. Using hand motions, users of this program can paint, draw, or write in midair, just like they would on a real canvas or whiteboard. OpenCV, an open-source computer vision framework that facilitates real-time image processing and analysis, is the project's main technological component. We can track a user's hand motions, identify the position and trajectory of their gestures, and convert them into digital artworks on a virtual canvas by integrating OpenCV with gesture recognition algorithms. canvas. This project exhibits the fusion of art, technology, and human-computer interaction, and has the potential to completely change how we engage with digital art. Air Canvas provides a fresh and exciting platform for artistic exploration, catering to a wide range of users including professional artists, educators searching for a fun teaching tool, and individuals who simply enjoy creative expression. In this project, we will go into the technical details of utilizing OpenCV to construct an Air Canvas application, outlining the image processing, gesture detection, and UI design strategies required to realize this creative concept. We'll walk you through making your own air canvas app using step-by-step instructions and sample code, fostering creativity and generating fresh approaches to interacting with digital art. So let's get started on this thrilling quest to build an Air Canvas app where the virtual canvas becomes your playground and your imagination knows no bounds

1.1 Problem Statement:

There are no crayons or paints in the present system; it works only with your fingers. Our focus is on the challenging task of recognizing and distinguishing a finger from an RGB image in the absence of a depth sensor. Other problems include movement beneath the pen and the absence of a top.

The RGB camera usesone system, which is swappable. Finding the bottom up is not feasible, and a pen cannot be pursued. As a result of drawing every finger path, the final image is abstract and unnoticed in the model. To use real-time hand touch to move the process location from one region to another, a great deal of code care is required. In order to effectively manage his strategy, the user must also be proficient in a variety of moves. The survey's main goal is to identify remedies for There are no crayons or paints in the present system; it works only with your fingers. Our focus is on the challenging task of recognizing and distinguishing a finger from an RGB image in the absence a some of the most urgent social issues.

People with hearing impairments deal with a wide range of issues on a daily basis. When speaking with someone who is impaired, sign language is not usually utilized, even though most people take listening for granted. Secondly, waste of paper is not uncommon. Writing and drawing paper are examples of wasted paper. Paper comprises 25% of commercial trash, 50% of landfills, 93% of sources, and so on. On-air writing is an easy way to tackle these problems. It will facilitate communication for the hard of hearing. You might receive a response to your online text or see it in augmented reality. One can write fast and efficiently while on the air.

1.2 Purpose

The goal of the Air Canvas Application project is to develop an innovative and interactive digital drawing platform that enables users to use hand gestures and a camera-based system that is driven by OpenCV (Open Source Computer Vision Library) to paint and draw in the air. The following goals are intended to be accomplished by this creative project: Gesture-Based Drawing: This technology allows users to draw digital artwork without the need for standard input devices like a mouse or stylus by allowing them to move their hands or a pointing device in the air.

Real-Time Visualization: Give customers the ability to witness their artwork come to life while they sketch in the air by providing real-time visualisation of the drawing process. This function gives instant feedback and improves the user experience. Selecting a Dynamic Brush: Use a mechanism that facilitates instantaneous switching between several virtual brushes and colors, allowing for a wide variety of creative expression. intuitive user interface: Create an interface that is easy to use and understand for individuals of all ages and backgrounds. The application must to be simple to use and understand. Gesture Recognition: To understand hand gestures and translate them into drawing commands, use OpenCV for hand and gesture recognition. Customization and exportation: Permit users to export and preserve their digital. works.

Give users the ability to modify brush attributes, line thickness, and other artistic components. Worthwhile entertainment and education: In addition to providing an engaging and imaginative experience, the program may be used as a teaching tool to impart computer vision and image processing concepts a channel for users. Cross-Platform Compatibility: Create a program that can run on a variety of operating systems, including Windows, macOS, and Linux, to make it accessible to a large user base. open source cooperation Promote community involvement and open-source cooperation to continuously improve the features and capabilities of the program.

1.3 Scope

The Air Canvas Application Project aims to produce an OpenCV-based computer vision application that tracks and interprets users' hand movements in the air to enable users to make digital drawings in real-time. By using OpenCV's image processing capabilities and computer vision algorithms to recognize and transform hand motions into artistic strokes on a digital canvas, this project seeks to provide an interactive and user-friendly platform for creating digital art. This project's main objectives are as follows:

Real-time Hand Tracking: To precisely detect and track a user's hand in front of a camera, implement powerful hand tracking with OpenCV.

Gesture Recognition: Create algorithms that can identify different hand movements and gestures, like erasing, choosing tools, changing colors, and sketching.

Digital Canvas Interaction: Provide an intuitive and responsive drawing environment for users by creating a virtual canvas on which they can draw and manipulate with their hand movements.

Features & Customization: Add options for stroke thickness control, color selection, erasing, undo/redo operations, and exporting or saving drawings.

User-Friendly Interface: Create an application with an easy-to-use interface that enables people to navigate and use it with ease.

Calibration and Accuracy: To ensure a seamless and painless drawing experience, make sure that precise hand tracking and accurate gesture detection are in place.

2. PROPOSED SYSTEM

Using OpenCV, a system architecture for a "Air Canvas" application requires a number of essential parts. With the help of this software, users can use camera-captured movements to paint or sketch in the air. A flowchart and a simplified system architecture are shown below: Air Canvas Application's System Architecture

User Interface (UI): The front-end element that communicates with the user is this one. It offers choices for launching, pausing, and customizing the drawing session. shows the drawing canvas for people to use. offers choices for choosing the brush size and color.

Camera Module: Uses the computer's camera as an interface to record gdg frames in real time. gives the Image Processing Module's video feed. takes in the camera's video stream. carries out real-time picture processing and analysis to identify user gestures.

3. SYSTEM METHODLOGY

Air Canvas is a software application used for digital white boarding and collaboration. While I can provide some general hardware and software requirements, it's essential to check the official documentation or system requirements provided by the application's developer, as they may change over time. As of my last knowledge update in January 2022, here are the basic hardware and softwarerequirements for Air Canvas

3.1 Hardware Requirements:

Computer or Device: Air Canvas is often available for multiple platforms, including Windows, macOS,iOS, Android,

and web browsers. Ensure your device meets the minimum requirements for your chosenplatform.

Processor: A modern multi-core processor (e.g., Intel Core i5 or equivalent) for smooth performance.

Memory (RAM): At least 4 GB of RAM, though 8 GB or more is recommended for better performancewhen working with larger canvases.

Graphics: A standard integrated graphics card should suffice for basic functionality. For more advanced features, such as 3D modeling, a dedicated GPU might be required.

3.2 Software Requirement:

Operating System: Air Canvas may have different versions for different operating systems. Ensure that your OS is supported. Commonly supported OS include Windows 7 or later, macOS 10.12 or later, iOS10 or later, and Android 5.0 or later.

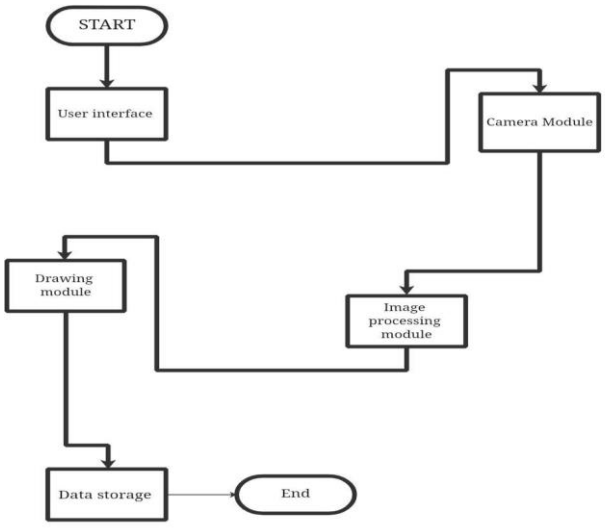
Web Browser: If you're using the web version, make sure you're using a compatible web browser (e.g., Chrome, Firefox, Safari, or Microsoft Edge) and that it's up to date.

Internet Connection: A stable internet connection is necessary for real-time collaboration and cloud-based features.

Drivers: Ensure that your device's drivers, especially for graphics and input devices, are up to date.

Input Device: A stylus or digital pen can enhance your experience with Air Canvas, especially if you're using a touch-enabled device or a drawing tablet**.**

Display: A screen with a resolution of at least 1024x768 is recommended. For optimal results, cons



4. LITERATURE SURVEY

SR NO	Name	Year	Working
1	EgocentricView Fingertip Detection for Air Writing Based on Convolutional Neural Networks by Yung-Han Chen 1,Chi-Hsuan Huang 1,Sin-Wun Syu 1,Tien-Ying Kuo 2ORCID andPo-Chyi Su 1	2021	A practical air-writing scheme for smart glasses is presented in this paper. A region-based convolutional neural network model is developed for real-time fingertip localization. MobileNetV2 is employed as the backbone network, which is further simplified by reducing the number of bottleneck layers to avoid redundant features.
2	Air Doodle: A Realtime Virtual Drawing Tool by Authors: Soham Pardeshi, Madhuvanti Apar, Chaitanya Khot, Atharv Deshmukh	2022	The project has the perspective to change the traditional ways of interpreting the information. It annihilates the need to carry a notebook to jot down notes, providing a simple solution of saving a soft copy. It increases the easiness to draw characters or write something in real-time without the need to jot down something in a notebook and then share the book
3	Saira Beg, M. Fahad Khan and Faisal Baig, "Text Writing in Air," Journal of Information Display Volume 14, Issue 4	2013	This paper presents a video based pointing method which allows writing of English text in air using mobile camera. Proposed method have two main tasks: first it track the colored finger tip in the video frames and then apply English OCR over plotted images in order to recognize the written characters. Moreover, proposed method provides a natural human-system interaction in such way that it do notrequire Keypad, Pen or

			Glove etc for character input. It just requires a mobile camera and red color for reorganization a finger tip
4	] T. A. C. Bragatto, G. I. S. Ruas, M. V. Lamar, "Real-time Video-Based Finger Spelling Recognition System Using Low Computational Complexity Artificial Neural Networks", IEEE ITS,pp. 393-397,	2006	Previous systems have explored the challenges of designing an interface for automotive styling which combine the metaphor of 2D drawing using physical tape with the simultaneous creation and management of a corresponding virtual 3D model. These systems have been limited to only 2D planar curves while typically the principal characteristic curves of an automotive design are three dimensional and non-planar
5	Erik B. Sudderth, Michael I. Mandel, William T. Freeman, Alan S. Willsky, "Visual Hand Tracking Using Nonparametric Belief Propagation", MIT Laboratory For Information & Decision Systems Technical Report P2603, Presented at IEEE CVPR Workshop On Generative Model-Based Vision, Pp. 1-9,	2004	We have demonstrated that the geometric models commonly used for hand tracking naturally have a graphical structure, and exploited this fact to build an effective hand tracking algorithm using nonparametric belief propagation. We are currently investigating more challenging test sequences, as rigorous comparison of our algorithm to existing methods. Preliminary results indicate that accurate tracking through significant self–occlusion will require a more so phisticated local likelihood approximation, as well as richer

5.PROJECT IMPLEMENTATION

5.1 Algorithm Used for Implementation:

Start reading the frames and convert the captured frames to HSV color space (Easy for color detection).

Prepare the canvas frame and put the respective ink buttons on it.

Adjust the track bar values for finding the mask of the colored marker.

Preprocess the mask with morphological operations (Eroding and dilation).

Detect the contours, find the center coordinates of largest contour and keep storing them in the array for successive frames (Arrays for drawing points on canvas).

Finally draw the points stored in an array on the frames and canvas

6. CONCLUSION

In conclusion, developing an "Air Canvas" application using OpenCV offers a fascinating and practicalway to explore the capabilities of computer vision technology. This application provides users with an innovative means of creating digital art by using their hand gestures to draw on a virtual canvas. Throughout the development process, several key points can be highlighted Challenges.

7.FUTURE WORK

Future work of our project is creating such an application, programmers can run into issues with precision of hand tracking, resilience of gesture identification, and performance enhancement. Further developments may entail honing these points, enhancing gesture detection powers, and adding new functions like sharing and storing images. More capabilities, such as an eraser and drawing shapes for the Air Canvas application, are on the way. In conclusion, developing an application called "Air Canvas" with OpenCV offers a fascinating chance to combine technology and art. With its innovative approach to allowing users to express themselves through digital art, the programme can be both amusing and informative. Applications such as these have a promising future because to computer vision's ongoing invention and advancement, despite potential obstacles.

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