Shri B. V. V. Sangha's

BASAVESHWARA ENGINEERING COLLEGE, BAGALKOTE-587102

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Report On

Project Phase-II
(UIAI610P)

Air-Canvas-For-Artist

Guide	HOD
DR. Vishwanath Kagawade	DR. A. D. Devangavi

Project Associates

Geetesh Kamble	2BA20AI008
Md Shadab M Islampur	2BA20AI014
Nasir P Sanadi	2BA20AI015
Rohan P Pujari	2BA20AI023

Academic Year: 2022-2023

B. V. V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE

BAGALKOT-587102

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

2022-2023

CERTIFICATE

This is to certify that the Project Phase-II work entitled "AIR-CANVAS-FOR-ARTIST" is a bonafied work carried out by Mr. Geetesh Kamble(2BA20AI008), Mr. Md Shadab M Islampur(2BA20AI014), Mr. Nasir P Sanadi(2B20AI015) and Mr. Rohan P Pujari(2B20AI023) in partial fulfilment for the award of degree of Bachelor of Engineering in Artificial Intelligence and Machine Learning(AIML) of Basaveshwar Engineering College, Bagalkot, affiliated to Visvesvaraya Technological University (VTU) Belagavi during the year 2022-2023. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the award of Bachelor of Engineering Degree.

Place: Bagalkot

Date:

Project Guide
DR. Vishwanath Kagawade

Head of the Department
DR. A. D. Devangavi

Examiner 1_____

Examiner 2_____

Examiner 3_____

I . ACKNOWLEDGEMENT

An endeavour is successful only when it is carried out under proper guidance and with the blessings. We would like to thank the people who have helped us in carrying out this work bylending their assistance to us.

Though words are not enough to express the simple gratitude towards everyone who helped directly or indirectly in our endurance, this is humbled attempt to do so.We express our heartfelt gratitude to the almighty for giving us the unending strength and mental support in proceeding with this project successfully.

We are indebted to our principal, Dr.S.S. Injaganeri and Head of the Department, Dr. Anil D. Devangavi Sir for providing excellent academic in the institution and giving us an opportunity to do the project, and all the facilities rendered

We extend our sincere gratitude and thanks to our Project Guide, Dr. Vishwanath Kagawade Sir for guidingus throughout the project and for their unending assistance, encouragement, motivation and support, without which we believe, it would not have been possible for us to complete this project successfully.

We would like to thank all the teaching and non-teaching staff of our department for their valuable support and assistance.Last but not the least we thank our family, friends and all who have helped us directly or indirectly in doing this project.

II. ABSTRACT :

With increasing technology each sector needs to be modernized. With the improvement of clever gadgets, the system can be now controlled virtually with aid of using human gestures. While using paint, sometimes we feel difficult to draw and feel like drawing our imagination just by waving our hand. The Project Air-Canvas For Artist makes a speciality of growing a motion-to- textual converter.

This project works on hand tracking system development which aims to track the hand which acts as pen and functioning as pen to create or draw different shapes and also as an eraser using Open Computer Vision Library (OpenCV) and MediaPipe. The existing project which allows us to draw just by waving hand uses technology or methodology which takes a lot of process and time. System Camera is used to track the hand and create drawings.

During the COVID-19 epidemic, it has been extremely difficult to engage kids in the classroom via an online platform. Children needed a classroom that was free of dust as a result. This article describes a novel paint application that recognises hand movements and monitors hand joints using MediaPipe and OpenCV.

With the use of hand gestures, this programme enables people to interact with computers in a natural way. The main objective of HCI is to enhance human-computer interaction. This study put out a method for writing in the air with your fingertips without gloves or sensors. Air writing enables us to write characters in open spaces and draw shapes with a specific colour on the fingertip. The colour marker is applied to the user's fingertip and aids the camera in recognising hand motions.

III. TABLE OF CONTENT :

Chapter 1: INTRODUCTION

1.1 Introduction :

Air-Canvas for Artist is an innovative and exciting project that combines the power of machine learning with the creativity of digital art. This project seeks to provide a novel and intuitive interface for artists and designers to create beautiful digital drawings and paintings using nothing but the air around them.

Air-Canvas for Artist is a project that uses machine learning techniques to recognize hand gestures and movements to draw on a virtual canvas. The project allows the user to draw and write in the air with their hand, which is detected by a camera and then processed by a machine learning algorithm to determine the shape and location of the drawn object. The project uses Python as the programming language and utilizes the OpenCV library for computer vision tasks and the Keras library for deep learning models.

The Air-Canvas for Artist project is useful for artists, designers, and other creative professionals who want to explore new ways of creating digital art. It is also an exciting example of how machine learning technology can be used to enable new forms of human-computer interaction. By combining computer vision and deep learning algorithms, the Air-Canvas-with-ML master project provides a unique and engaging experience for users**.**

For most people nowadays, digital art takes the place of traditional writing as their primary means of expression. We call it "digital art" when we use digital medium to convey our artistic expressions and messages. Digital manifestation is distinguished by its reliance on modern science and technology.

There were different kinds of art forms before digital art was created. There are four types of art: visual art, audio art, audio-visual, and audio-visual imaginative. This includes everything from literature to painting to sculpture to architecture to music to dance and theatre. However, digital and traditional creative forms are inextricably intertwined. However, human life's fundamental necessities are the driving force behind societal progress. There is a similar phenomenon in art. The link between digital and traditional art is now so intertwined that we need to study both of them meticulously

1.1 Problem Statement :

Air-Canvas For Artist aims to address the limitations of traditional digital art creation tools by providing a new and innovative platform for artists and designers to create digital drawings and paintings using the air around them as a canvas.

The project utilizes machine learning algorithms based on deep learning techniques to track and interpret human movements in real-time, allowing users to create digital art in a more intuitive and natural way.

The goal is to provide an accessible and intuitive tool for digital art creation that enables more people to explore their creative potential, fosters innovation and experimentation, and enables new forms of artistic expression.

1.2 Objectives :

- To push the boundaries of machine learning and computer vision technologies: This project aims to explore the potential of machine learning algorithms for creating interactive and intuitive interfaces for digital art creation. By incorporating deep learning techniques, the project aims to push the boundaries of what is possible in terms of tracking and interpreting human movements in real-time.

- To foster creativity and innovation: By providing an accessible and intuitive platform for digital art creation, Air-Canvas For Artist aims to foster creativity and innovation among artists and designers. The project seeks to break down barriers to entry by making digital art creation easy and intuitive, thus enabling more people to explore their creative potential.

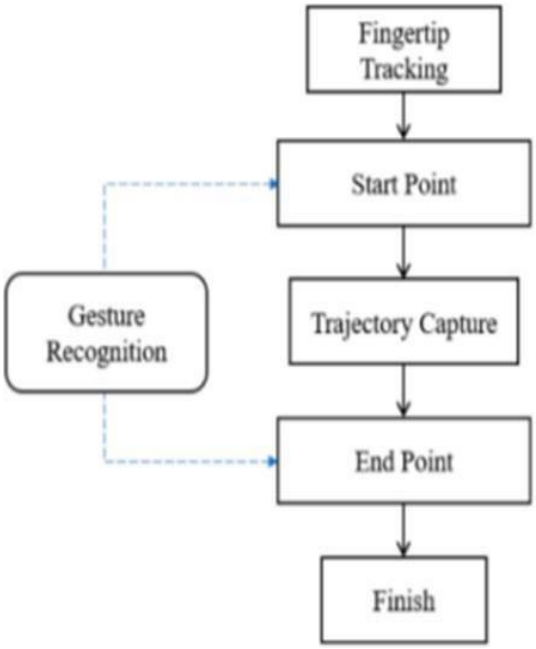
- To enable new applications in education, design, and rehabilitation: Air-Canvas For Artist aims to explore the potential applications of this technology in a wide range of fields, including education, professional design, and the medical field for rehabilitation purposes. By providing an accessible and intuitive tool for digital art creation, the project has the potential to impact a wide range of industries and applications.

Chapter 2: LITERATURE SURVEY AND DESIGN MODULE

2.1. Literature Survey :

REFERENCE	TITLE	AUTHORS	YEAR	SUMMARY
1	"Air Writing: Detection of Handwritten Characters and Words Using a Wrist-Worn Inertial Sensor"	Zhihan Lv, Xiaojuan Ma, Liang Wang, and Wei LiuZhihan Lv, Xiaojuan Ma, Liang Wang, and Wei Liu	2018	The paper proposes a system for detecting handwritten characters and words in the air using a wrist-worn inertial sensor. They achieve a recognition accuracy of 91.57% for character recognition and 87.09% for word recognition.
2	"Handwriting Recognition Using Accelerometer and Gyroscope"	Jagrut Bhatt and Jigar Patel	2017	The paper presents a system for recognizing handwritten characters in the air using data from an accelerometer and gyroscope. They achieve a recognition accuracy of 88.65% for character recognition and 81.82% for word recognition.

2.2. Design Module :



2.3 Algorithm :

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

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

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

4. Pre-process 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).

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

Chapter 3: TECHNICAL INFORMATION

3.1 Hardware Requirement :

- **Processor:** A multi-core processor with a clock speed of at least 2.5 GHz or higher is recommended for better performance. Examples include Intel Core i5 or i7 processors, or AMD Ryzen processors.
- **RAM:** A minimum of 8 GB of RAM is required, although having 16 GB or more is recommended for smoother operation, especially when working with machine learning tasks.
- **Graphics Card:** A dedicated graphics card with at least 2 GB of VRAM is recommended to handle the computational demands of the machine learning algorithms. NVIDIA GPUs, such as GeForce GTX or RTX series, or AMD Radeon GPUs are suitable choices.
- **Storage:** Sufficient storage space is required to store the Air Canvas application and related files. A minimum of 256 GB SSD (Solid State Drive) is recommended for faster read/write speeds, which can improve the overall performance.
- **Operating System:** Air Canvas supports Windows, macOS, and Linux. Ensure that your hardware is compatible with the operating system of your choice.
- **Display:** A monitor or display with a resolution of at least 1920x1080 pixels is recommended for a better user interface experience.

3.2 Software Requirement :

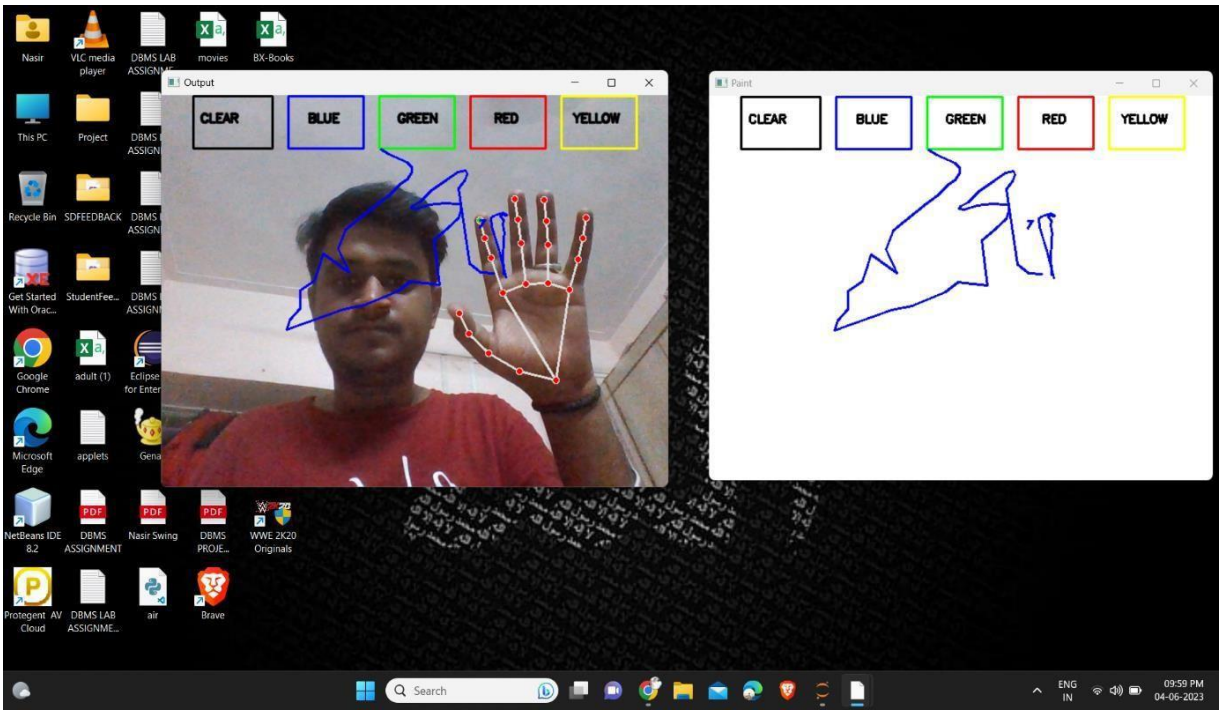
- **Operating System:** Air Canvas supports multiple operating systems, including Windows, macOS, and Linux. Ensure that your operating system is up to date and compatible with the application.
- **Python:** Air Canvas is typically developed using Python programming language, so you need to have Python installed on your system. It is recommended to use the latest stable version of Python.
- **Python Libraries:** Install the necessary Python libraries and dependencies required for running the ML Master project and Air Canvas. The specific libraries can vary based on the project, but common libraries used in machine learning projects include TensorFlow, Keras, OpenCV, NumPy, and Matplotlib. You can use package managers like pip or conda to install these libraries.
- **Machine Learning Frameworks:** Depending on the ML algorithms used in the ML Master project, you might need to install specific machine learning frameworks. For example, if the project involves deep learning, you would need to install deep learning framework.
- **Integrated Development Environment (IDE):** It's recommended to use an IDE for coding and running the ML Master project. Popular choices include PyCharm, Jupyter Notebook, and Visual Studio Code. Choose the IDE that you are comfortable with and supports your chosen operating system.

Chapter 4: IMPLEMENTATION

4.1 Implementation of Code :

- **Set up the Hardware:** You will need a device with a camera, such as a laptop or a smartphone, to capture the movements of the user's hand. Additionally, you may need a colored object or a special glove to track the hand movements accurately.
- **Collect Training Data:** Gather a dataset of hand gestures and corresponding labels. For example, you can record videos or capture images of various hand gestures representing different shapes or actions you want to recognize on the canvas.
- **Preprocess the Data:** Preprocess the collected data by extracting the hand region and filtering out the background. You can use image processing techniques or pre-trained models like OpenCV to accomplish this task.
- **Develop the Air Canvas Application:** Create an application that captures the video feed from the camera and performs real-time hand gesture recognition. Use the trained model to classify the hand gestures and identify the corresponding action or shape.
- **Map Gestures to Actions:** Once you have recognized the hand gestures, map them to specific actions on the canvas. For example, you can associate a circle gesture with drawing a circle on the canvas, or a swipe gesture with erasing the canvas.
- **Display the Canvas:** Show a virtual canvas on the screen where users can draw or interact using their hand gestures.
- **Implement Drawing Functionality:** Enable drawing on the canvas based on the recognized hand gestures. You can use libraries like OpenCV to draw shapes or lines on the canvas based on the user's hand movements.
- **Test and Refine:** Test the air canvas application by drawing different shapes or performing various actions. Iterate and refine the model and application based on user feedback and observed performance

4.2 Output :


Output
CLEAR
BLUE
GREEN
RED
YELLOW
Paint
CLEAR
BLUE
GREEN
RED
YELLOW
Search
ENG
IN
09:59 PM
04-06-2023

Chapter 5: MOTIVATION

5.1 Motivation :

The motivation behind Air-Canvas For Artist is to provide a new and innovative platform for digital art creation that is accessible and intuitive for all users, regardless of their background or experience with digital art tools.

Air-Canvas For Artist enables users to explore their creative potential and experiment with new forms of artistic expression.

The project's use of machine learning algorithms based on deep learning techniques enables real-time tracking and interpretation of user movements, creating a more natural and intuitive user experience and enabling new forms of artistic expression.

Chapter 6: CONCLUSION AND FUTURE SCOPE

6.1 Conclusion :

This application might put conventional writing techniques to the test. removes the need to carry a handheld device around in order to take notes and provides a convenient option to accomplish the same while on the road. It will once more serve a greater good by making communication simpler, especially for people who are familiar with them.

The software is simple enough to use for those who have trouble using the keyboard. Soon, this program's capability will allow for the control of IoT devices.

Additionally, air painting is possible. With the help of this system, people will be able to interact with the digital world more effectively while wearing smart gear.

The system will be an excellent software for smart wearables using which people could better interact with the digital world. Augmented Reality can make text come alive. There are some limitations of the system which can be improved in the future.

6.2 Future Scope:

Computer Vision is the science of helping computers perceive and interpret digital pictures such as photos and movies. It's been a decades-long topic of intense investigation. Computer vision is getting better than the human visual cognitive system at spotting patterns from pictures. Computer vision-based technologies have surpassed human doctors' pattern recognition skills in the healthcare industry .Let us examine the status of computer vision technology now and in the future. There are several aspects to consider when computer vision expands its effect on the human world. With further study and fine-tuning, computer vision will be able to do more in the future. The system will be simpler to train and can identify more from photos than it does presently. Computer vision will be used in conjunction with other technologies or subsets of AI to generate more attractive applications. Image captioning apps, for example, may use natural language generation (NLG) to understand things in the environment for visually impaired persons. Computer vision may help create artificial general intelligence (AGI) and artificial superintelligence (ASI) by processing information better than the human visual system. Computer vision is a growing sector linked to virtual and augmented reality (VR and AR). Recent market participants have shown a great interest in VR/AR fusion. This significant growth in attention is mirrored in the release of several cutting-edge technology items.

Chapter 7 : REFERENCES

7.1 References :

[1] Yash Patil, Mihir Paun, Deep Paun, Karunesh Singh, Vishal Kisan Borate, “Virtual Painting with Opencv Using Python”, First International Conference on Computer Engineering International Journal of Scientific Research in Science and Technology Volume 5 Issue 8, November 2020.

[2] Hemalatha Vadlamudi, “Evaluation of Object Tracking System using Open-CV In Python”, International Journal of Engineering Research & Technology (IJERT) Vol. 9 Issue 09, September-2020.

[3] Kavya Venugopalan, Safa tp, “Survey On Air Writing Recognition”, IJREAM, Volume 05, Issue 02, DOI:1035291/2454-9150.2019.0084, May 2019.

[4] Siddharth Mandgi, Shubham Ghatge, Mangesh Khairnar, Kunal Gurnani, Prof. Amit Hatekar, “Object Detection And Tracking Using Image Processing”, Vol. 8, Issue 2, (Part -1) pp.39-41, February 2018.

[5] Y. Huang, X. Liu, X. Zhang, and L. Jin, "A Pointing Gesture Based Egocentric Interaction System: Dataset, Approach, and Application," IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), pp. 370-377, 2016.

[6] P. Ramasamy, G. Prabhu, and R. Srinivasan, "An economical air writing system is converting finger movements to text using a web camera," International Conference on Recent Trends in Information Technology (ICRTIT), Chennai, pp. 1-6, 2016