



Virtual Ink Using Python

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Abstract:

There has been a revolutionary development in the field of computer vision with the advancement of technology in the past few years. **Computer vision** is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do. Computer vision tasks include methods for acquiring, processing, analysing and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information.

We use python as our primary language and it packages OpenCV and NumPy. Basically, **OpenCV** is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by **Willow Garage**.

And **NumPy** is basically, a is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

Our Project is basically a computer vision application which uses the webcam of your device. By opening the webcam of your device all you need is to just hold the pencil or some pen in our hand, then drag the pen or pencil in air but it should be in front of your device camera (approx.15-30 cm).

Then, the computer screen will the display what you have dragged in front of your device.

Keywords: Computer Vision, Artificial Intelligence, Python Programming, dimensional data, OpenCV, Willow Garage, NumPy.

1. Introduction

Computer vision is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do.

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The objective of our project is

1. Design a project using Python Programming Language.
2. Implement object-oriented programming concepts such as inheritance, overloading and classes.
3. Manipulate different types of data using appropriate data structures such as list, array.
4. Practice analysing debugging technique.
5. Analysing the optimal output.

We use OpenCV and NumPy libraries of Python Programming language. **OpenCV** (Open-Source Computer Vision) is an open-source library that includes several hundreds of computer vision algorithms. And **NumPy** is a python library used for working with arrays. It also has functions for working in domain of linear algebra, Fourier transform, and matrices.

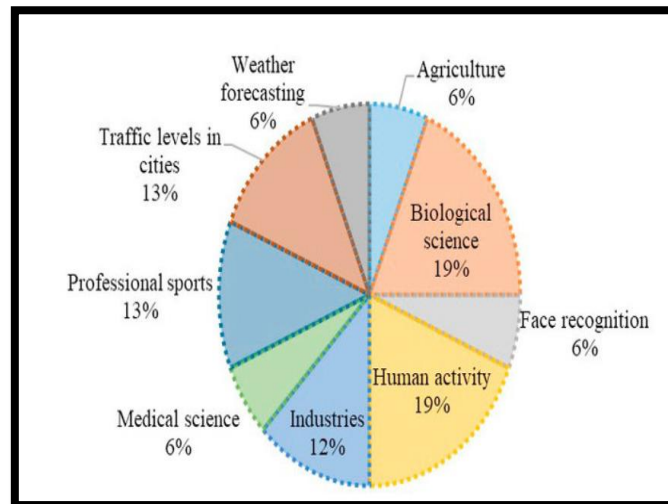


Figure 1: Pie Chart Showing Applications of Computer Vision

This paper uses the Computer Vision technology for making a virtual ink which is used as something like a virtual notepad. It allows the user to write just like you are writing on a piece of paper. This will be very cost effective which help the economically weaker section people especially in India. Our project can easily replace iPads for a good cause.

2. Classification of Computer Vision Techniques

Depending upon the same features extracted from the objects, good classification approaches can get better and the best result.

Three commonly used methods exit are described in the following

- **Template Technique:**

This technique is used for searching maximum matching of objects. All the objects feature to be classified are stored in a database, including desirable variation in performances, viewpoints, and illumination. Each object is normalized in size and compared with every template of the same feature.

Template matching is fast and easy to modify for new classes. Its potential use is that it is time-consuming when geometry transform is complex. This issue can be compensated with

genetic algorithm because of its powerful searching ability, quick response and less templates left for matching.

- **Neural Network:**

This method is currently the best and most successful and widely used in learning classification algorithms. Its advantage is that it can be tolerant to faults and errors. It is also powerful to classify through training of the neural networks with some specific colours, shape pictogram features of the interest regions can be recognised. Its commonly models contain black propagation network, multilayer perception network, Hopfield network, radial basis network etc.

- **Support Vector Machine:**

It is used for extending statistic learning theory to classification, employing structural risk minimization principle to improve generalization capability. It is able to solve problems with respect to non- linear, high dimension, local minimum and also invariable with view-point.

3. Proposed Work

The main objective of our project is to

- The Virtual Ink will allow you to write on your laptop or PC without writing on a paper using any pencil or pen.
- We come through a problem that during the lockdown period, we face that as many of the teachers are not able to deliver lecture by using black board.
- So, we think that to make an application regarding this problem.

Implementation of our project:

- ❖ First, we will write a python program by using OpenCV and NumPy package.
- ❖ We use Visual Studio Code or PyCharm IDEs to write Python code.
- ❖ Then, we will use these programs to create a Web application using HTML, CSS and JavaScript.
- ❖ Design the web page layout and then decide which tools or plugin to add in our web page.
- ❖ Next, we will prepare an android application also.

We will create an Interface by using our python program. This will need your webcam of your device and then it will require a pen so that the webcam can identify the colour of the pen with the use of Computer Vision and then we drag something in the air (but in front of the camera to detect the pen as an object), the result will appear on the screen of our device.

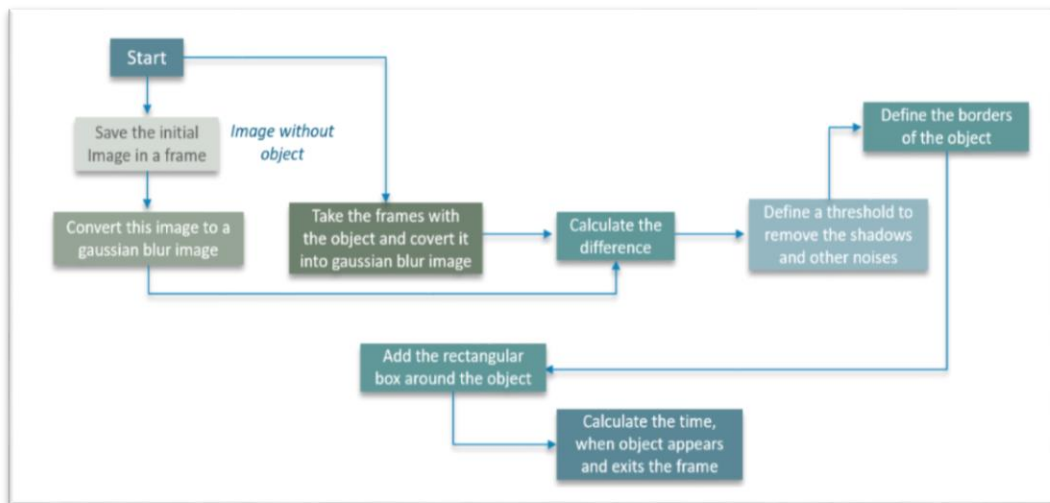


Figure 2: Roadmap for our Project Implementation

Some of the important terms we used in our project

1. NumPy (Python Library)

- a. NumPy is a python library which we used to implement arrays.
- b. NumPy stands for Numerical Python.
- c. It is a library where we can implement different functions to represent Linear Algebra, Fourier Transformations and Matrices.

2. OpenCV (Python Library)

- a. It is a Python library where we can use it to develop real-time computer vision applications.
- b. It focuses on image processing, video capturing and some analysis features like face detection and object detection.

3. Imread function

- a. It returns the image data in an array.
- b. If the file contains a greyscale image, then the array is a two-dimensional (M*N) array.
- c. If the file contains a coloured image, then the array is a three-dimensional (M*N*3) array.
- d. For most file formats, the coloured image the data returns use RGB colour space.

4. Imshow function

- a. It displays the value low as black and displays value high as white.
- b. The values between low and high are displayed as intermediate shades of grey, using the default number grey levels.

4. Result and Discussion

Since, our project is very feasible and will be easy to use. The user Interface of our project is easy to use and will be accessible to everyone not only teacher but students also. Our project will be use by anyone and the project will provide a best solution for those students who don't have iPad or even touch-screen laptops.

The Python programming language is open source, this makes our project very executable to anyone. The only thing to ensure is that your webcam is working and that's all, then the rest is our duty to provide you the service of **Our Project** i.e., Virtual Ink.

5. Conclusion

This project is fully based on Computer Vision and Python libraries especially OpenCV and NumPy. We choose red pen as default image as OpenCV reads images and then gives the required output.

The OpenCV converts image into RGB When the image file is read with the OpenCV function `imread ()`, the order of colours is BGR (blue, green, red). On the other hand, in Pillow, the order of colours is assumed to be RGB (red, green, blue). Therefore, if you want to use both the Pillow function and the OpenCV function, you need to convert BGR and RGB.

Initially, we have 4 basic colours inks in our Project Red, Blue Green and Yellow, a Clear Screen tab and a tab containing font size.

6. Acknowledgement

We would like to express our special thanks of gratitude to our teachers as well as our Galgotias University who gave us the golden opportunity to do this wonderful project on the topic **Virtual Ink Using Python** which also helped us in doing a lot of Research and we came to know about so many new things. We are really thankful to them.

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7. References

- [1] <https://www.topbots.com/most-important-ai-computer-vision-research/>
- [2] <https://opencv.org/about/>
- [3] <https://numpy.org/doc/stable/reference/generated/numpy.info.html>
- [4] <https://www.edureka.co/blog/python-opencv-tutorial/>
- [5] <https://machinelearningmastery.com/what-is-computer-vision/>