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Image Cartoonization

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ABSTRACT

This project presents an approach for cartoonizing digital images using the OpenCV library. Unlike traditional manual methods or complex deep learning models, this system utilizes a structured combination of classical image processing filters like Bilateral, Gaussian and Median to generate high-quality cartoon effects. Each filter is layered in a specific sequence to enhance features and produce a visually appealing, cartoon-like output. The approach balances performance and quality, offering fast processing suitable for real-time applications. This framework is flexible, extendable, and can serve both as a standalone module or an integrated component in broader computer vision systems.

1. INTRODUCTION

Image Cartoonization transforms real-world photographs into cartoon-like images by simplifying colors, enhancing important edges, and applying stylized effects.

- This technique creates images with a more creative, animated, and unique appearance for various artistic uses.
- It is achieved through computer programs, mobile apps, or coding techniques such as OpenCV and image processing libraries.

Cartoonization is popular for creating custom profile pictures, posters, digital artwork, and engaging social media content, offering a fun and practical way to stylize regular photos

2-REQUIREMENT ANALYSIS

Functional Requirements

The Image Cartoonization application transforms real-world images into cartoon-like visuals by applying a series of image processing techniques in real time. It features an easy-to-use interface, high-speed processing, and consistent quality cartoonization.

The Image Cartoonization consists of the following modules:

User Module:

- Input Handling Module:
  - ➢ Captures video input from the webcam.
  - ➢ Uses cv2.VideoCapture to retrieve frames in real time.
- Display and Termination Module:
  - ➢ Displays processed cartoonized frames in a real-time window.
  - ➢ Terminates the program cleanly when a specific key is pressed.

System Module:

- Pre-processing Module:
  - ➢ Applies bilateral filtering to smooth the image while keeping edges sharp.
  - ➢ Reducing noise to produce a clean, cartoon-like effect.
- Edge Detection and Contour Module:
  - ➢ Detects edges using the Canny edge detection algorithm

➢ Draws contours to simulate cartoon-style outlines.

Computational Resources

Hardware Requirments

- Processor : Intel i3
- RAM : 10GB
- Hard Disk : 20GB

Software Requirements

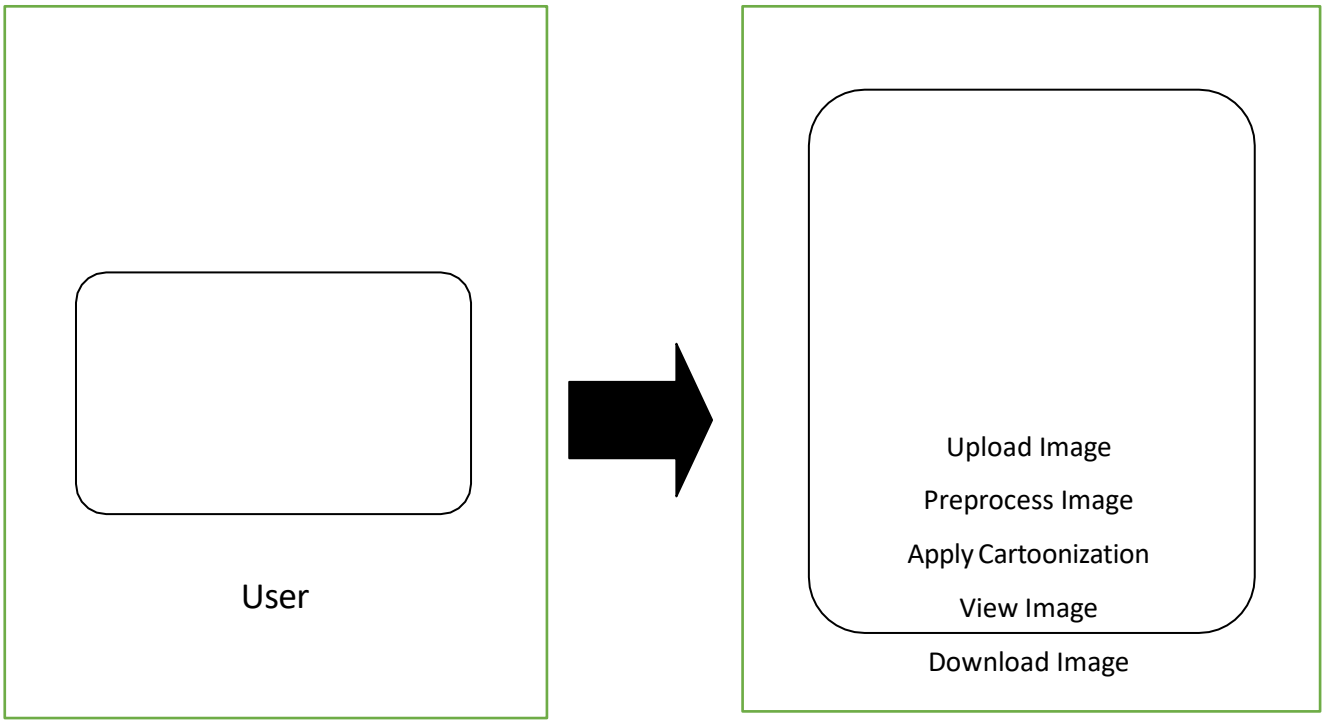
- Programming Language : Python 3.13.3
- IDE : IDLE, VS Code1.97
- Framework : Flask 3.1.1

3-DESIGN

Architecture

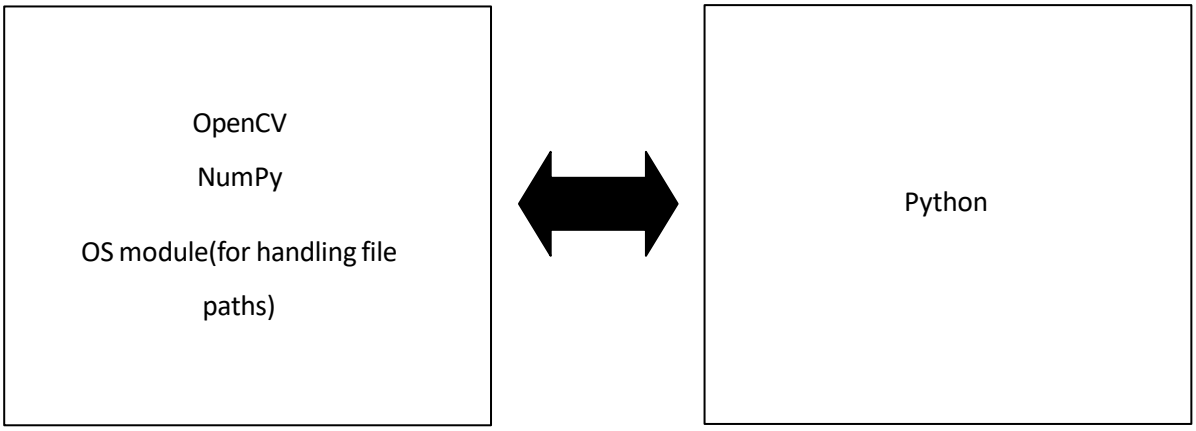
Project architecture represents number of components we are using as a part of our project and the flow of request processing i.e. what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system.

Software Architecture



Software Architecture

Technical Architecture



Technical Architecture

4-Implementation

This system is developed using the Python programming language along with popular libraries for image processing and graphical interface development.

Python

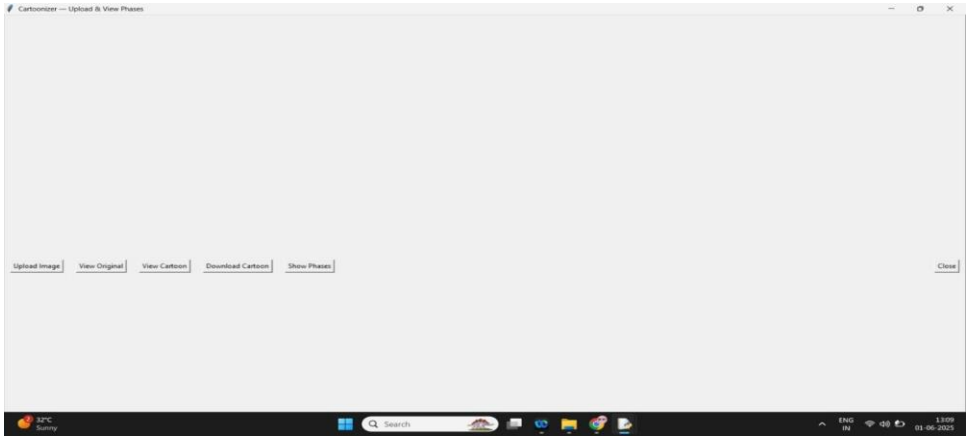
Python is an easy-to-learn, high-level programming language. It is known for its clear and simple syntax, which makes it a popular choice for beginners as well as experienced developers. Python is widely used in various fields such as web development, data science, artificial intelligence, machine learning, and image processing.

In this project, Python is used because it has powerful libraries and tools for working with images and building applications quickly. Python makes it easier to handle images, perform operations like filtering, edge detection, and display the final output.

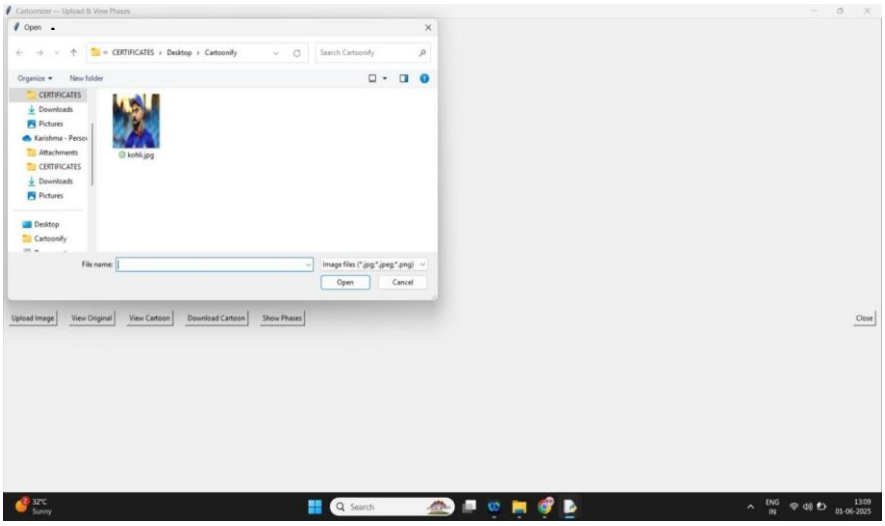
For writing and testing the Python code, IDLE (Integrated Development and Learning Environment) and VS Code (Visual Studio Code) are used as development tools. These IDEs provide useful features like:

- Syntax highlighting
- Smart indentation
- Autocompletion
- Easy debugging
- Running scripts directly

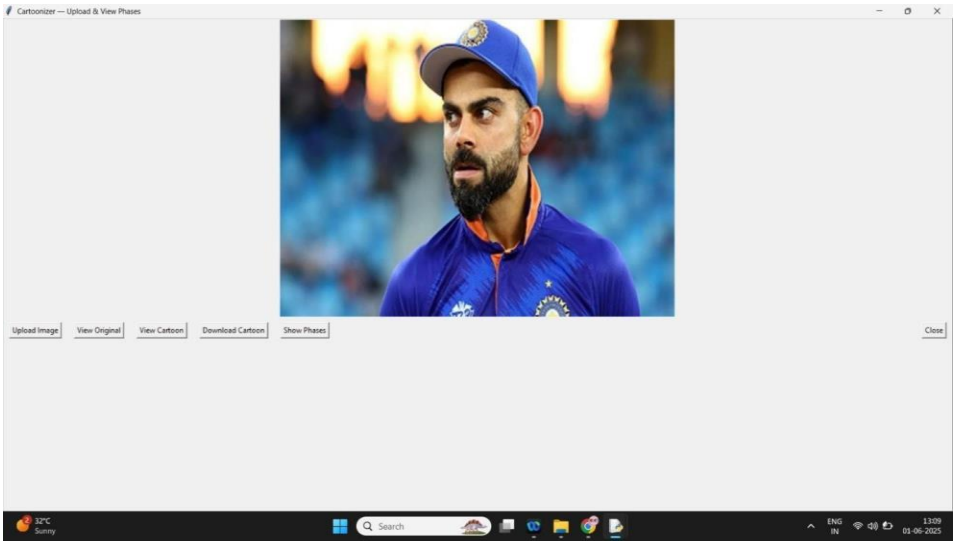
5-SCREENSHOTS



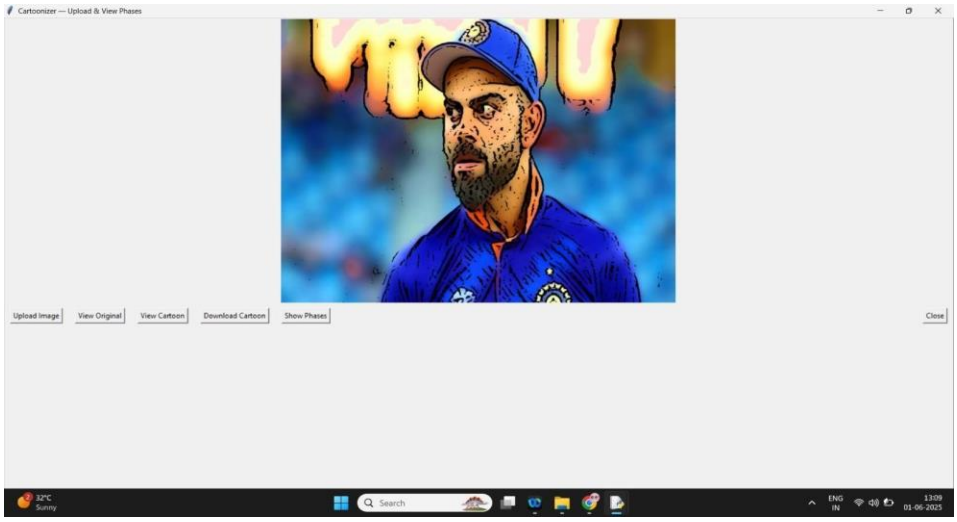
Screenshot 1:Execution open window for image upload



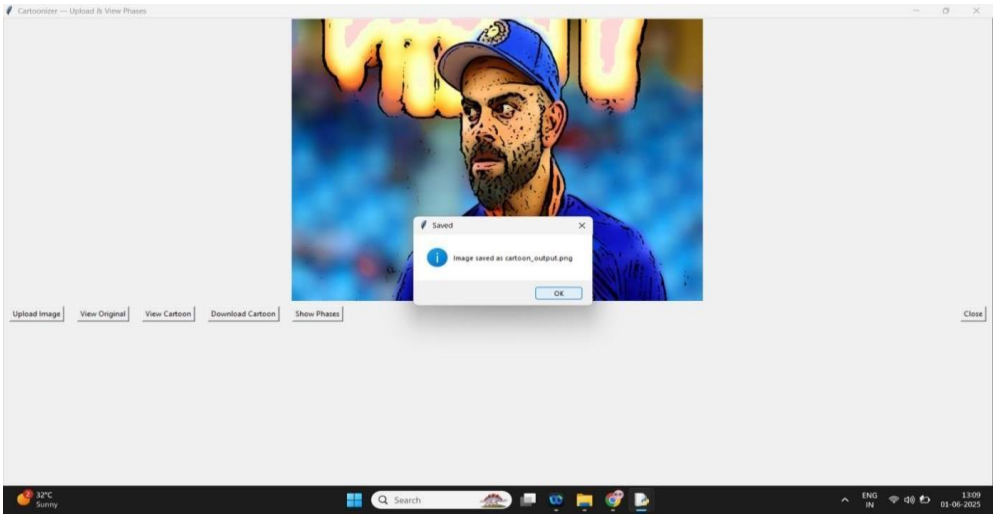
Screenshot 2:Upload Image



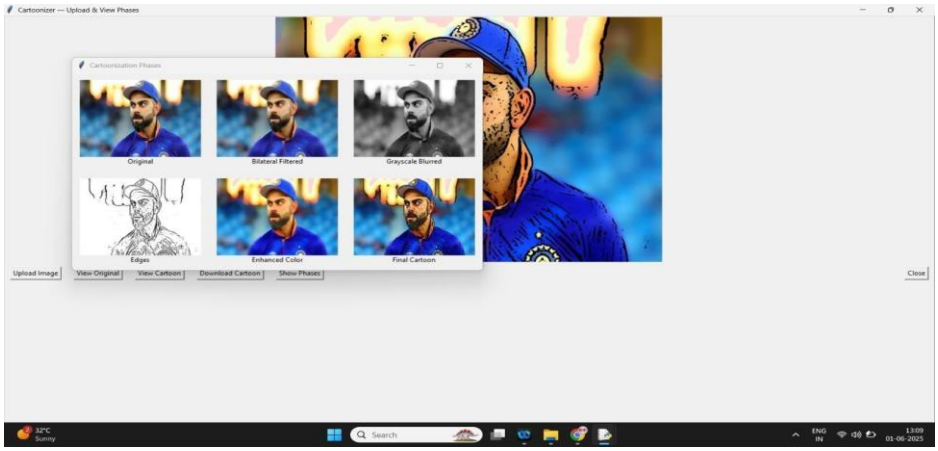
Screenshot 3:Display of original image



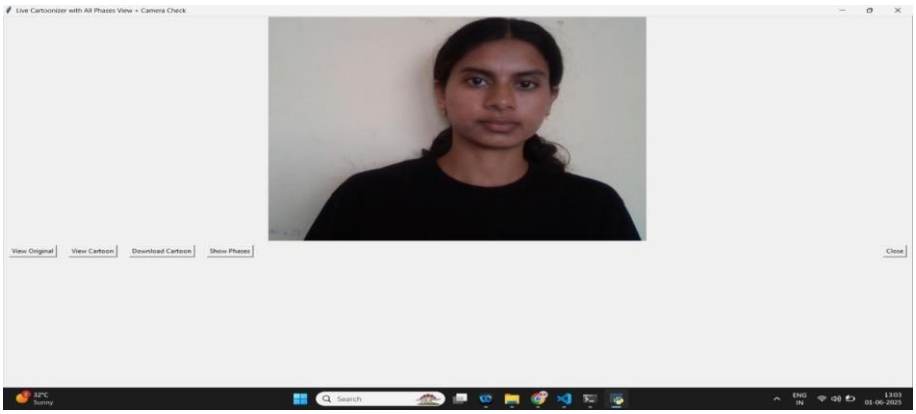
Screenshot 4:Display of Cartoonized Image



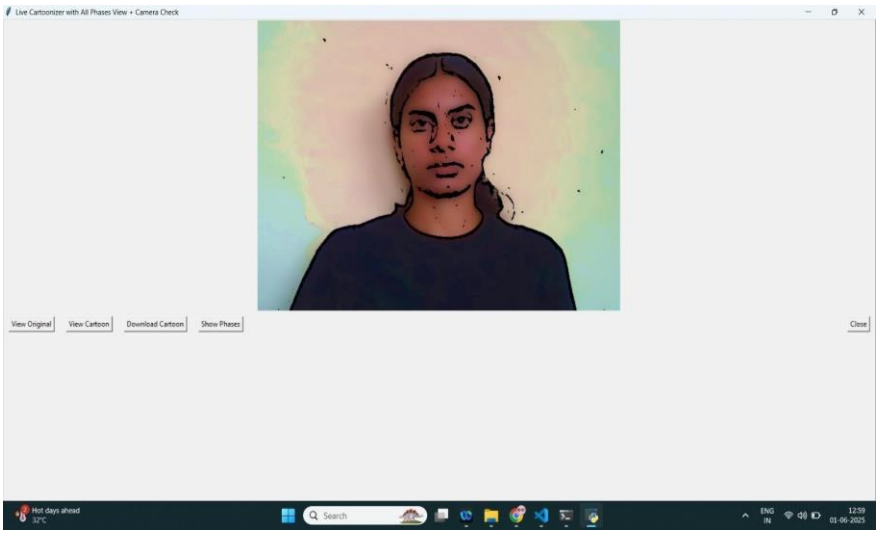
Screenshot 5:Download Image



Screenshot 6:Display image conversion filters



Screenshot7:Live capture the image



Screenshot 8:Cartoonized Image in live

6-CONCLUSION

The Image Cartoonization project successfully transforms real-world images into cartoon-like visuals, demonstrating the effectiveness of advanced image processing techniques.

Future Scope

The future of Image Cartoonization using OpenCV is very exciting. As people look for more fun and creative content, this technology can be used for making custom avatars, social media filters, and educational pictures. By adding AI, it can improve the quality, offer different cartoon styles, and work in real-time. As AR and VR technology grows, cartoonization will become important for creating fun and interactive experiences. It can also help in healthcare and therapy, making it easier for kids and people with special needs to communicate. In addition, it can change the way games and stories are made by turning real images into cartoon characters.

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