



Image to pencil recognition using Machine learning technique and Open CV

Submitted In Partial Fulfilment of the Requirements

for the Degree of

Bachelor of Technology

In

Artificial Intelligence & Data Science

Submitted by:

KASAK(02715611922) & JYOTI RANA((05415611922)

Under Guidance of :

Dr. Archana Kumar (H.O.D [AI&DS] & Professor,)

Mr. Ritesh Kumar (Assistant Professor)

Department of Artificial Intelligence & Data Science

Dr. AKHILESH DAS GUPTA INSTITUTE OF TECHNOLOGY & MANAGEMENT

(A Unit of BBD Group)

Approved by AICTE and Affiliated with GGSIP University

FC-26, Shastri Park, New Delhi-110 053



CONTENT

- 1. INTRODUCTION**
- 2. PROBLEM STATEMENT**
- 3. OBJECTIVES**
- 4. LITERATURE REVIEW**
- 5. METHODOLOGY**
- 6. RESULTS & INTERPRETATION**
- 7. H/W & S/W REQUIRMENTS**
- 8. FUTURE SCOPE & CONCLUSION**
- 9. REFERENCES**



INTRODUCTION

“IMAGE TO PENCIL RECOGNITION USING MACHINE LEARNING TECHNIQUES & OPEN CV”

- This technology utilizes creativity to offer users a fun and artistic method to transform their photos into sketches. It converts digital images into realistic and aesthetically pleasing pencil sketches.
- The primary objective is to make art accessible to a broad audience, and democratize it's use.
- It will bridge the gap between photography and drawing by analyzing the original image and generating a new image that captures its essence in a stylized, hand-drawn manner.





PROBLEM STATEMENT

Developing accurate and efficient models that can transform colour images into high-quality pencil sketch.

Digital photographs often capture rich details and colors, but sometimes a simpler, artistic representation can be desirable. This project aims to develop a user-friendly application that addresses this need by providing a solution to:

Convert digital images into pencil sketches: The application should transform uploaded photos into grayscale images with enhanced edges, creating a visually appealing sketch-like effect.

This application caters to users who want to:

Add an artistic touch to their photos: By converting them to sketches, users can explore a different aesthetic for their digital images.

Simplify complex visuals: Sketches can sometimes provide a clearer focus on the subject matter of an image compared to the original photograph.



OBJECTIVES

- **Simulating a Pencil Drawing:** The core aim is to automatically create a digital image that resembles a pencil sketch of the original photo. This involves capturing the essence of a traditional sketch, including shading, lines, and textures, to give the impression of a hand-drawn artwork.
- **Data Analysis:** In some cases, converting to sketch can help simplify an image for easier analysis, especially when focusing on edges and shapes.
- **Extracting Key Features:** By converting to grayscale and emphasizing edges, the process aims to highlight the most important features of the image. This can be useful for focusing on shapes, outlines, and the overall composition of the original picture.



LITERATURE REVIEW

Several research has contributed to advancements in “image-to-pencil sketch” recognition.

S.no	Author's name	Title of paper	Year of Publication	Research	Limitation
1.	Saeko Takagi, Noriyuki Matsuda, Masato Soga, Hirokazu Taki, Takashi Shima, Fujiichi Yoshimoto	“An Educational Tool for Basic Techniques in Beginner's Pencil Drawing”	2003	AI-powered system was developed to help beginners learn basic pencil drawing techniques. It assesses the user's sketches and provides guidance based on the motif data through four subsystems, including motif feature extraction, sketch feature extraction, error identification, and advice generation and presentation.	May not carry the discontinues lines.
2.	Jin Zhou, Baoxin Li	"AUTOMATIC GENERATION OF PENCIL-SKETCH LIKE DRAWINGS”	2005	New algorithm introduced that turns personal photos into pencil sketch-like drawings using gradient transformation and final smoothing for visually striking results	May not suitable for photos except personal photos.
3.	Shuo Sun Tianjin, Dongwei Huang Tianjin	“Efficient Region-Based Pencil Drawing”	2007	Enhanced method in the generation of automatic pencil drawings using Line Integral Convolution (LIC), the goal of the algorithm is to enhance image quality by improving image segmentation and texture direction detection techniques.	May not distinguish the important and unimportant lines.



LITERATURE REVIEW

S.no	Authors name	Title of paper	Year of Publication	Research	Limitation
4.	Jiang, Yifeng	“Combining Sketch and Tone for Pencil Drawing Rendering	2015	Involves two stages: generating a stroke layer to represent shapes and producing tonal textures to depict brightness and shades.	May not perform better with natural scenes.
5.	Yijun Li, Chen Fang, Aaron Hertzmann, Eli Shechtman, Ming-Hsuan Yang	“Im2Pencil: Controllable Pencil Illustration from Photographs”	2019	Two-branch model is created to generate sketchy outlines and tonal shading for pencil drawings. Clean outlines and tonal illustrations are extracted from the original image, and the model creates different pencil styles in a user-controllable manner	May not focuses on Multiple Strokes.
6.	HUAPING ZHOU, CHAO ZHOU, AND XIAOYAN WANG	“Pencil Drawing Generation Algorithm Based on GMED”	2021	New algorithm called GMED is developed It uses gradient maps and morphological operations to extract lines, and texture filling and tone mapping to create a realistic effect	It is less user friendly.
7.	Dong Wang, Guiqing Li, Chengying Gao, Shengwu Fu, and Yun Liang	“Featurepreserving colour pencil drawings from photographs”	2023	Method for generating feature-preserving colour pencil drawings from photographs by enhancing lightness and reducing saturation is proposed. The approach includes devising lightness enhancement and saturation reduction mappings to mimic the tonal style.	Feature preserving but lacks the Potential challenges.



METHODOLOGY

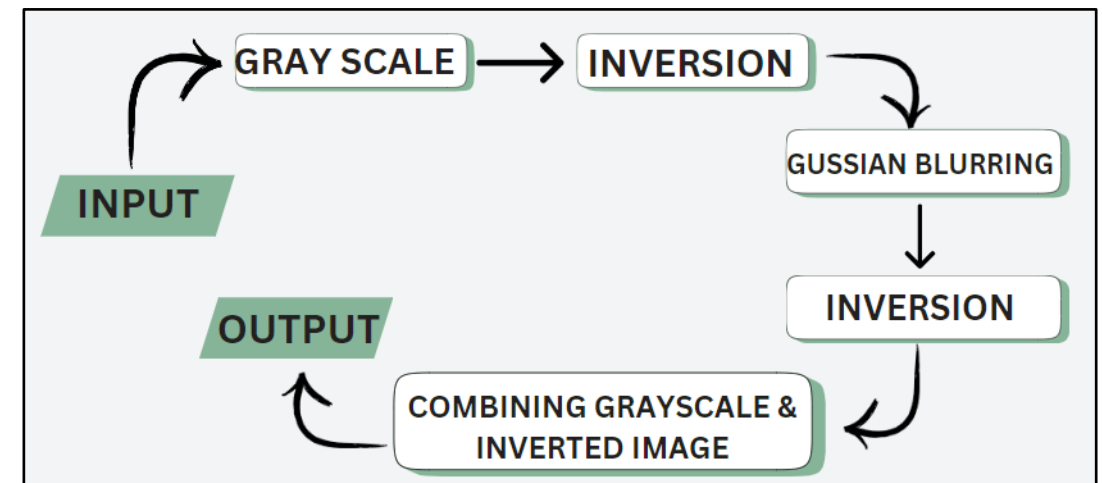


3.1 Preprocessing

- ❑ **Image Reading:** The process starts by reading the user-selected image with OpenCV's `cv2.imread` function, which stores it as a NumPy array for further processing.
- ❑ **Grayscale Conversion:** The loaded colour image is converted to grayscale to focus on shading and texture, discarding colour information. It helps in simplifying algorithms and as well eliminates the complexities related to computational requirements.

3.2 Edge Enhancement

- ❑ **Image Inversion:** The image is inverted using a bitwise NOT operation, which flips the intensity values.
- ❑ **Gaussian Blurring:** A Gaussian blur filter is applied to the image for noise reduction and to preserve significant edges.
- ❑ **Second Inversion:** After blurring, the image is inverted twice with bitwise NOT, amplifying edges for sketch generation.





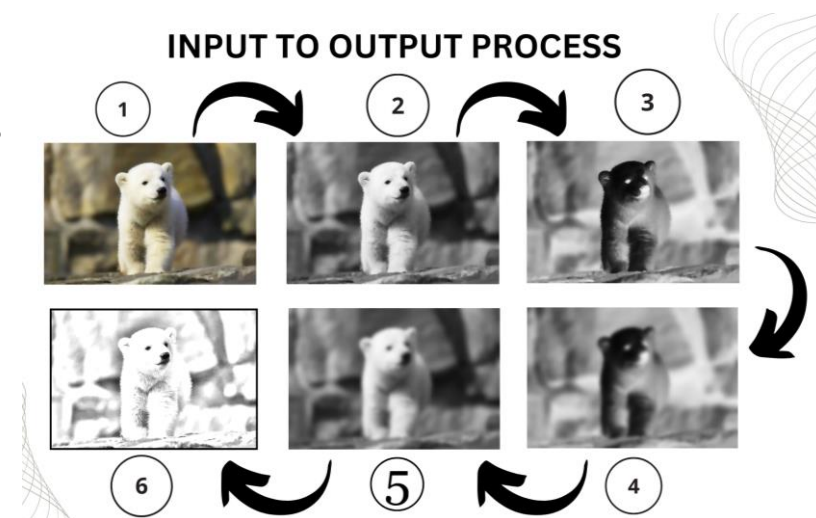
RESULTS & INTERPRETATION

The application successfully bridges the gap between digital photographs and artistic expression, generating visually appealing pencil sketches. The core image processing techniques work in harmony to achieve this transformation.

- Grayscale conversion sets the stage by focusing on light and shadow variations, crucial for capturing the essence of a sketch.
- Edge enhancement acts like an artistic brush, highlighting details and offering control through the blur level. A larger blur creates a more abstract and impressionistic feel, while a smaller blur retains finer details for a realistic sketch.
- Finally, colour dodging breathes life into the sketch by creating a shading effect, mimicking pencil strokes.

The interplay of these techniques delivers visually striking results.

The application effectively transforms images, capturing their essence with a touch of artistic flair.





H/W & S/W REQUIRMENTS

➤ Software Requirements:

This Image to Sketch converter application utilizes the following software libraries:

- **Python 3** : Python is a versatile and beginner-friendly programming language known for its readability and clear syntax. It's widely used for web development, data science, machine learning, and automation tasks.
- **OpenCV library**: This library provides extensive functions for image processing tasks, including reading, converting, and manipulating images.
- **Kivy framework**: This framework is used to build the graphical user interface (GUI) of the application, allowing users to interact with the conversion process.
- **NumPy library**: This library is essential for numerical computations involving arrays, which is helpful for image processing tasks.
- **Pillow (PIL Fork)**: This library provides tools for working with image data as Pixel Access Objects (PAOs).

➤ Hardware Requirements:

- A standard computer capable of running the software listed above should be sufficient.
- The processing power and memory required will depend on the size and complexity of the images you plan to convert.



FUTURE SCOPE & CONCLUSION

- **Photography Enhancement:** Photographers might use this technology to add artistic flair to their images, creating stylized versions of their photos that mimic traditional pencil sketches.
- **Educational Tools:** Students and educators in art and design fields could use these tools to explore different artistic styles or learn about various techniques used in sketching.
- **Customization and Advanced Features:** Machine learning can enhance pencil sketching with advanced customization options for more realistic and expressive results.



REFERENCES

- [1] Saeko Takagi†, Noriyuki Matsuda, Masato Soga, Hirokazu Taki, Takashi Shima, Fujiichi Yoshimoto “An Educational Tool for Basic Techniques in Beginner’s Pencil Drawing” Proceedings of Computer Graphics International Conference, CGI · 1August 2003.
- [2]Jin Zhou, Baoxin Li “AUTOMATIC GENERATION OF PENCIL-SKETCH LIKE DRAWINGS” 0-7803-9332- 5/05/\$20.00 ©2005 IEEE.
- [3] Shuo Sun Tianjin, Dongwei Huang Tianjin “Efficient Region-Based Pencil Drawing” WSCG '2007: Full s Proceedings University of West Bohemia Plzen Czech Republic, January 29 – February 1, 2007, p. 279-286.
- [4] Jiang, Yifeng “Combining Sketch and Tone for Pencil Drawing Rendering” Rensselaer Polytechnic Institute Department of Electrical, Computer, and Systems Engineering ECSE 4540: Introduction to Image Processing, Spring 2015.
- [5]Yijun Li, Chen Fang, Aaron Hertzmann, Eli Shechtman, Ming-Hsuan Yang “Im2Pencil: Controllable Pencil Illustration from Photographs”. IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2019, pp. 1525-1534.
- [6] HUAPING ZHOU, CHAO ZHOU, AND XIAOYAN WANG “Pencil Drawing Generation Algorithm Based on GMED” Digital Object Identifier 10.1109/ACCESS.2021.3065428.
- [7] Dong Wang, Guiqing Li, Chengying Gao, Shengwu Fu, and Yun Liang, “Featurepreserving colour pencil drawings from photographs” Computational Visual Media, <https://doi.org/10.1007/s41095-022-0320-6> Vol. 9, No. 4, December 2023, 807–825