**Mini Project Report on**



**Cartoonifying an Image using Deep Learning**



**Submitted in partial fulfillment of the requirement for the award of the degree of**

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE & ENGINEERING**

**Submitted by:**

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**Department of Computer Science and Engineering**

**Graphic Era (Deemed to be University)**

**Dehradun, Uttarakhand**

**January 2023**

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**CANDIDATE’S DECLARATION**

I hereby certify that the work which is being presented in the project report entitled **“Cartoonifying an Image using Deep Learning”** in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineeringof the Graphic Era (Deemed to be University), Dehradun shall be carried out by the under the mentorship of **Dr. Vikas Tripathi, Associate Dean (R&D)**, Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun.

**Name** **University Roll no**

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**INTRODUCTION**

**INTRODUCTION**

Social media is extensively used these days. And standing out in this online crowd has always been a to-do on every user’s list on these social media platforms. Be it images, blog posts, artwork, tweets, memes, opinions and what not being used to seek attention of followers or friends to create influence or to connect with them on such social platforms. We aim to provide one such creative solution to their needs, which is applying cartoon like effects to their images. Users can later share these images on any social media platforms, messengers, keep it for themselves, share it with loved ones or do whatever they like with it. Nowadays almost everyone is registered in social networks. We keep online status updated every day, share photos and comments, follow our friends’ news. To have a nice profile is a matter of prestige. You can use a photo of your own in a profile image, create an amusing avatar or turn your photo into a cartoon. With a pool of web applications available online, an image conversion to cartoon takes few clicks.

**ABSTRACT**

The image processing plays a major role in all computers related applications. The image processing appears in many real-life applications, e.g., home security, banking system, education sector, defense system, Railway, and so on. There are various factors that enables to produce the essence of an image. The concerns are contrasting and appropriate color mixing, matching between any two pixels connecting two cells, accurate placing of objects together combined to form image features. In the recent times there happened to be drastic changes in ample fields. The uplift of these fields enhances in betterment of the society.

The basic concept in this algorithm involves the technique of converting the RGB color image to an accurate, cartooned image without multiple filtrations or blurred image without proper facilitation of edge detection. This user interface allows to apply the animation effects. This naturally provides an artistic effect and comics as well with wide range of pictures.

**NEED OF PROJECT**

Creating a cartoon like effect is time and space consuming. Existing solutions to provide cartoon like effect to images are complex. Some solutions involve installing complex photo editing software like photoshop and other involve performing some tasks by user. Our research shows a website to carry out the task of Applying effects is more suitable, space efficient and takes minimum user efforts, for example toony photos is an existing website to perform such task but it is difficult to use as user has to markdown points & lines on the image to apply effects which is not user friendly also the options are limited. Hence there is a dire need for a website which is user friendly and performs the task of applying effects to images very well.

**LITERATURE SURVEY**

**Cartoonization**:

The process of converting real-life high-quality pictures into practical cartoon scenes is known as cartoonization.

**Blurring**

Blurring in terms of digital image processing is smoothing of the image, removing noise from it. Filtering is one of the fundamental operations of Image Processing. Filters like Gaussian Blur, Median Blur, blur images, but they also tend to smooth the edges. To avoid that we will use the Bilateral Filter.

Graphical user interface, application, PowerPoint

Description automatically generatedThe figure shows the most commonly used blurring techniques. It may be hard to distinguish but as the filter size is increased the difference becomes more visible.

**Canny Edge-detection**

Canny is a famous edge detection technique that uses the Canny 86 algorithm to detect edges. Since any edge detection technique is prone to noise in the image, we use the bilateral filter to remove them.

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**K-Means Clustering**

K-Means clustering is a clustering algorithm in which n observations are partitioned into k clusters. You may be thinking why do we need it? The answer is simple, think of the problem by considering each pixel in an image. Each pixel in an image is represented by 8 bits, which means each color channel can have 256 possible shades/values. Now if we cluster 8(n) bits(observations) into 5(k) bits, then the number of shades is reduced. If that happens, then the output image, instead of having a variety of shades will have clusters of same shades.

A collage of a house

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**Erosion**

Erosion is a morphological process that mostly deals with altering shapes in an image. Dilation and erosion are sister processes. In simple terms, they are used to thicken or lessen boundary shapes in an image. We will use it to erosion to thicken the contour boundaries to make them stand out.

Icon

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The above diagram represents erosion. The trick here is that we have black coloured outlines that we need to thicken therefore we use erosion and not dilation.

**OpenCV**

OpenCV is an open-source software containing pre-built functions and algorithms used for implementing Image Processing and Computer Vision. The python library that we will be using is “cv2”. It is one of the most widely used libraries in python with over 18 million downloads. We will be using some of those built-in functions to process our input image.

**METHODOLOGY**

**Step 1: Importing the required modules**

**Python:**We use python as a programming language for building the application.

**cv2:** We use cv2 for image processing.

**Numpy:** Mainly NumPy is used for dealing with arrays. Here the images that we use are stored in the form of arrays. So, for that, we use NumPy.

**easygui:** easygui is a module used for GUI programming in python. In our application easygui is used to open the file box to upload images from the local system.

**Imageio:** Imageio is a python library that reads and writes the images.

**Matplotlib:** Matplotlib is used for visualization purposes. Here we plot the images using matplotlib.

**OS:**Here in our application os is used for dealing with paths like reading images from the path and saving the image to the path.

**Tkinter:** Tkinter is a standard Graphical User Interface (GUI) package.

**SYS**: This module provides access to some variables used or maintained by the interpreter and to functions that interact strongly with the interpreter. e.g., exit ().

**Step 2: Building a File Box to choose a particular file**

Build the main window of our application, where the buttons, labels, and images will reside. Also give it a title by title () function.

**Step 3: Loading & Storing Image**

Now, just think, how will a program read an image? For a computer, everything is just numbers. Thus, in the below code, we will convert our image into a NumPy array.

**Step 4: Transforming an image to grayscale**

cvtColor(image, flag) is a method in cv2 which is used to transform an image into the color-space mentioned as ‘flag’. Here, our first step is to convert the image into grayscale. Thus, we use the BGR2GRAY flag. This returns the image in grayscale. A grayscale image is stored as grayScaleImage.

**Step 5: Smoothening a grayscale image**

To smoothen an image, we simply apply a blur effect. This is done using medianBlur () function. Here, the center pixel is assigned a mean value of all the pixels which fall under the kernel. In turn, creating a blur effect.

**Step 6: Retrieving the edges of an image**

Cartoon effect has two specialties:

1. Highlighted Edges
2. Smooth colors

In this step, we will work on the first specialty. Here, we will try to retrieve the edges and highlight them. This is attained by the adaptive thresholding technique. The threshold value is the mean of the neighbourhood pixel values area minus the constant C. C is a constant that is subtracted from the mean or weighted sum of the neighbourhood pixels. Thresh\_binary is the type of threshold applied, and the remaining parameters determine the block size.

**Step 7: Preparing a Mask Image**

In the above code, we finally work on the second specialty. We prepare a lightened color image that we mask with edges at the end to produce a cartoon image. We use bilateralFilter which removes the noise. It can be taken as smoothening of an image to an extent.

The third parameter is the diameter of the pixel neighborhood, i.e, the number of pixels around a certain pixel which will determine its value. The fourth and Fifth parameter defines signmaColor and sigmaSpace. These parameters are used to give a sigma effect, i.e make an image look vicious and like water paint, removing the roughness in colors.

It’s similar to BEAUTIFY or AI effect in cameras of modern mobile phones.

**Step 8: Perform color quantization technique**

To do color quantization, we apply the K-Means clustering algorithm which is provided by the OpenCV library. We can adjust the ***k*** value to determine the number of colors that we want to apply to the image.

**Step 9: Giving a Cartoon Effect**

So, let’s combine the two specialties. This will be done using MASKING. We perform bitwise and on two images to mask them. Remember, images are just numbers?

Yes, so that’s how we mask edged image on our “BEAUTIFY” image.

This finally CARTOONIFY our image!

**Step 10: Plotting all the transitions together**

To plot all the images, we first make a list of all the images. The list here is named “images” and contains all the resized images. Now, we create axes like subl=plots in a plot and display one-one images in each block on the axis using imshow() method.

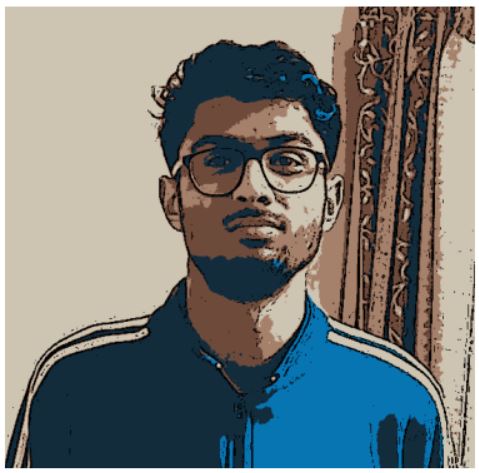
plt.show() plots the whole plot at once after we plot on each subplot.

Graphical user interface

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generated](data:image/jpeg;base64,/9j/4AAQSkZJRgABAQEAeAB4AAD/4RDyRXhpZgAATU0AKgAAAAgABAE7AAIAAAANAAAISodpAAQAAAABAAAIWJydAAEAAAAaAAAQ0OocAAcAAAgMAAAAPgAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAE5pbGVzaCBQb3BsaQAAAAWQAwACAAAAFAAAEKaQBAACAAAAFAAAELqSkQACAAAAAzA0AACSkgACAAAAAzA0AADqHAAHAAAIDAAACJoAAAAAHOoAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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**RESULT AND DISCUSSION**

**OBJECTIVE OF RESULT**

• Following area unit, the most objectives planned and accomplished during this analysis work.

• Rapid image processing with high detection rates

• To provide High accuracy model as compare with current existing models.

• To provide very low false positive rate

**SUMMARY**

In this OpenCV project, we’ve developed an image cartoonizer application using python. From this project, we’ve learned about thresholding and edge finding from an image, K-means clustering algorithm, color quantization technique, and some other basic image processing techniques.

**MOTIVATION OF RESEARCH**

• The higher literature review reveals that their varied gaps within the study of converting image to a cartoon image.

• An obvious disadvantage of smoothing is the fact that it does not only smooth noise, but also blurs important features such as edges and, thus, makes them harder to identify.

• Linear diffusion filtering dislocates edges when moving from finer to coarser scales.

• To implement multiple number of bilateral filters.

• To apply multiple number of values to the existing parameters.

**CONCLUSION**

**INFERENCE**

It includes origin and history of image processing , different types of uncertain environment , existing methos for cartoon imaging. An example image processing is helpful to issue in signature recognition , Digital video Processing , Remote sensing, and finance . This paper is presented for an efficient method for extracted cartoon effects. The test result shows that the developed method could extract meaningful object will in different characters and backgrounds. This application aims to enables people with visual impartment to live more independently. Cartoonizing an image will transform an image into its cartoon image. It makes an image looks vicious and like water paint , removing the roughness in colors. The main attraction of the paper is to solve different types of images having one object, two object and three object which can’t be solved by any of the exiting methods but can be solved by our proposed method.

**FUTURE SCOPE**

The cartooning of images has a tremendous scope in the animation industry. Animated pictures are frequently used in advertisements to keep the audience engaged. Animated pictures are often used for educational purposes especially for the younger age group. Cartooning of images also have a huge scope to print publications, and publishing companies. Gaming sector is looking very promising. Currently the system is facing issues with face cartoonization. This can be improved by providing more facials data with different perspective to the model. The resolution of the output also needs to be increased.

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