

# Image Cartooning

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## Abstract

Many photo editing applications allow transforming the images into cartoons. This pretty cool effect became extremely popular on social media over the past few years. I used OpenCV to create a program that can transform an image into a cartoon. To achieve this effect, I will be working with digital image processing, edge detection and color quantization methods.

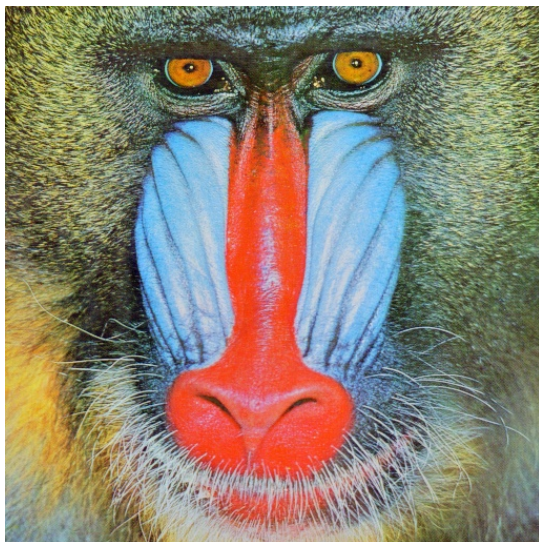
**Keywords** OpenCV, edge detection, bilateral filter, color quantization

## 1 Introduction

The objective of this program is to create a cartooned version of an image. The major differences between a cartoon image and a normal image are that the colors in the cartoon image are more homogeneous as compared to the normal image and the edges in the cartoon image are much sharper and more pronounced.

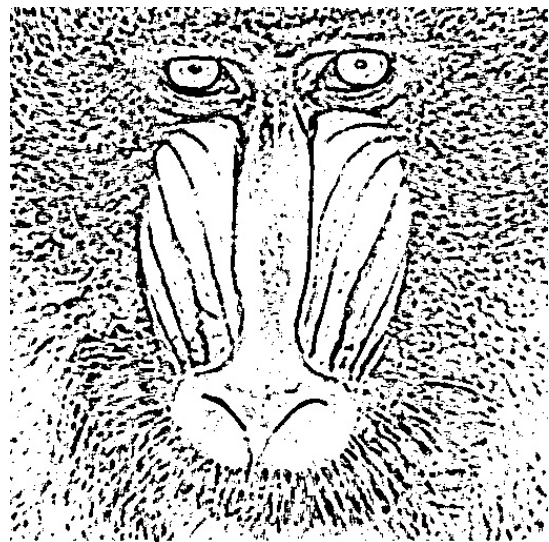
## 2 Implementation

The main steps involved in cartooning an image are edge detection and increasing the contrast of the detected edges followed by applying bilateral filter to the image to create homogeneous colors. Then quantization of colors in the image and the last step is to combine the quantized image and edges.



### 2.1 Edge Detection

To detect the edges in the input image, the function `adaptiveThreshold()` from the OpenCV library is used. This method calculates the threshold for smaller regions of the image. To achieve the best results in edge detection, the input image has to be converted to gray and the noise from the image has to be reduced. This removes the edges from detection that are undesired. I used the median filter to remove noise from the image. This replaces each pixel value with the median value of all the pixels in a small pixel neighborhood.



### 2.2 Bilateral Filter

To get the cartoon effect, the colors in the image need to appear more homogeneous. This can be achieved by smoothing the image, but at the same time, the edges in the image should be preserved. There are many filters available to smooth an image and a bilateral filter is one among them. A bilateral filter is a non-linear, edge-preserving, and noise-reducing smoothing filter for images. It replaces the intensity of each pixel with a weighted average of intensity values from nearby pixels. So, a bilateral filter is best suitable for this task.



### 3 Result



### 2.3 Color Quantization

This method is used to reduce the number of colors in the image. Color quantization is done by using the K-means clustering algorithm for displaying output with a limited number of colors. For this program I limited the number of colors to seven. The final step is to combine the quantized image and the edges.

### 4 References

- [https://en.wikipedia.org/wiki/Bilateral\\_filter](https://en.wikipedia.org/wiki/Bilateral_filter)
- <https://data-flair.training/blogs/cartoonify-image-opencv-python/>

