Computer Vision
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Project Proposal

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Problem statement:

The goal of this project is to stylize an inputted image to appear like a cartoon image. To accomplish this, we will detect the prominent shapes within the image and add an outline to them, as well as normalize the color groups of the image, narrowing each object to a pallet of a predetermined amount of colors. Additionally, we will apply minimal edge outlines within the image to make the primary textures more prominent.

Approach:

Normalizing Colors

Our approach for altering the colors will include normalizing the color pallet using hue saturation and grouping shade colors together. To normalize the pallet, we will choose a predefined set of colors that generalizes only a few colors to each object. This choice will be made using hue saturation techniques. We will then group together these colors by the objects they belong to in order to reduce the amount of color variation across the image.

Reinforcing Outlines

In order to create a hard outline of objects within the object, such as in a cartoon styled image, we will smooth and reinforce the outlines of objects within the images. We will smooth the outlines to be straighter and more defined to reduce excessive corners and line complexity. The techniques used in this will be Canny Edge Detection to first find the object lines and thresholding to detect and increase the thresholds of the images to a larger pixel value.

Smooth Textures

To recreate the textures of a cartoon, we will detect highly textured areas within the images and either replace those selected texture patterns with a reduced image bank of smoother textures or apply a median filter to blur the image slightly to reduce the textures. Our team will decide on the final technique utilized here through experimentation on the image to test for best results.

Experiments and results:

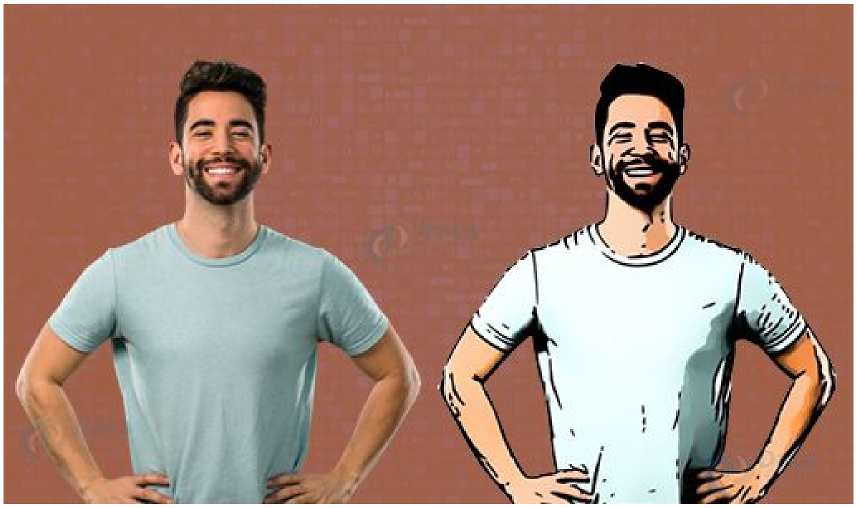
Experimental Setup

The execution process of our experiment will include creating a python file containing the code for the image transformation. Then, we will continue by inputting the full dataset of images into a predetermined method from the file to run all processes and getting back an outputted 5-by-3 plot of the now cartoon transformed dataset. The images of the same category (person, non-person object, scenery) will be plotted next to each other.

Dataset Used

The datasets we will be performing our experiments on will include a set of five images of people, five images of non-people objects, and five images of landscapes. We plan to use these varying images to test our techniques with multiple source types. An example of an image input and output from our dataset is shown in Figure 1 with the input being the left and the output being the right. The goal of our dataset is to provide examples of objects and backgrounds that could be transformed to appear as a traditionally cartoon styled image, such as images with only one to two main objects at center and a non-cluttered background.

Figure 1: Example input/output of “cartoonification”[1]

- 

Code Implementation Sources

Our only pre-existing source of code our team plans to utilize will come from problem sets we have completed in this class. We may use image transformation techniques directly from or based on these problem sets.

Defining Project Success

We define project success to be achieved if:

1. Both images of people, objects, and scenery are “cartoonified” successfully where external observers would believe the “cartoonified” image is actually animated.
2. The “cartoonified” image retains its defining features and and most prominent colors and is still easily identified while being simplified to simpler edges/lines, fewer normalized colors and more uniform textures
3. The group is able to unanimously agree that the results are qualitatively equal or better than the reference image of “cartoonification” (Figure 1)

Experiments

Our experiments will include a progressive list of tasks where each experiment will include a new functionality as well as the functionalities of the previous experiments. The order of functionalities, and respectively experiments, will be determined as :

1. Color Normalization: Are the outputted images' colors normalized in their objects and background?
2. Outline Smoothing and Reinforcing: Have the outputted images' object outlines when properly detected and reinforced?
3. Texture Smoothing: Do the o images have a consistent and smooth texturing?