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Cartoonization of Images and Videos with Gan Andopencv

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ABSTRACT

Comic books, anime, television shows, and social media fun events are just a few of the many possible uses for the cartoonization of images and videos. Image and video cartooning using Generative Adversarial Networks (GANs) is suggested here. Consequently, this paper proposes a method to alter real-life images and videos such that they resemble cartoons. In addition to carbonization, the paper suggests using the Python OpenCV library to build a user-centric image-hub that can upsample, denoise, and apply filters to input images. Included in the project is the ability to convert videos to GIFs, which can be used on different social media sites to create cartoon filters. Making use of a number of additional features beyond just cartoonization, the project is designed to be user-friendly.

1 INTRODUCTION

1.1 PROBLEM STATEMENT

Title: Cartoonization of Images and Videos using GAN and OpenCV Problem Statement: Develop a system for transforming images and videos into cartoon-like representationsusing Generative dversarial Networks(GANs) and the OpenCV library. The primary challenge is to balance between preserving the essential content of the input while incorporating stylistic elements characteristic of cartoons. The systemshould be adaptable to various input types, computationally efficient for real-timeprocessing, and feature a user-friendly interfacefor controlling cartoonization parameters. Additionally, it should generalize well to diverse content and lighting conditions, with quality evaluation metrics to ensure satisfactory output.

1.2 DESCRIPTION

In animation, a cartoon is a picture or series of pictures created from a predetermined order of drawings. These cartoons may represent realistic or non-realistic features. However cartoons have gained a huge attention especially by the children, teenagers and artists. Due towhich there exists many applications where cartoons are used. Some of these applicationsinclude cartoon television shows, comic magazines, cartoon based image filters andanimated films. Additionally, you might find some scenes from the actual world in some of the apps. To illustrate the point, a real-life city may appear in an animated film alongside a fictional one. These cartoon images are created by askillful artist manually drawing those scenes or by using computer software’s to create a single image. To obtain a better quality, the artists

need to drawlines and must shade eachcolor region based on real-life scenes. When working on animated comics or films, this entire process takes a lot of time and a lot of manual labor skills. On top of that, popular programs like Adobe Photoshop and Corel Draw don't come cheap, and newcomers might have trouble learning the ropes to get the results they need. So there is are quirement of technology that can help transform a real-world based photo or video into an animated image or video respectively. When used in conjunction with other programs, this technology can let users quickly and easily turn their real-life photos and videos into cartoon versions on demand, or use it as an image filter .To create cartoon versions of images, GIFs, or videos, we present a method based on Generative Adversarial Networks (GANs) that includes features like picture denoising and picture up scaling. Using OpenCV, the images were upsampled and denoised. A collection of still images and animated GIFs are utilized to educate the model. In order to generate cartoon pictures or videos that weren't in the training data, the trained model is useful.
image no 1: cartooon image

2 LITERATURE SURVEY

"Convolutional neural networks for photo-to-comic conversion" We offer a new method that uses deep convolutional neural networks (CNNs) to revolutionize photostocomics, which is motivated by Gatys's recent work. While Gatys's approach, which employs a pre-trained VGG network, typically yields satisfactory results when applied to more elaborate styles like painting, it frequently falls short when applied to simpler styles like comics. To tackle this, we have introduced a special convolutional neural network (CNN) trained to identify comic book covers and other related photos. This new network improves upon previous efforts at comic stylization by accurately capturing a wide range of styles. Unfortunately for comic book creators, Gatys's method can still generate colored output even when working with grayscale images. We guarantee the synthesis of a grayscale image by developing a modified optimization framework.

We further initialize the output image using a grayscale version of the content image to avoid convergent to poor local minima. Compared to the current state-of-the-art method, our method produces superior synthetic comic images, as demonstrated by multiple examples. With our proposed solution, "CartoonGAN: Generative Adversarial Networks for Photo Cartoonization," we aim to address a valuable and challenging problem in computer vision and computer graphics: how to convert photos of real-world scenes into cartoon style images. There has been a recent uptick in the use of learning-based approaches to artistic image stylization, and our solution is no exception. Nevertheless, current approaches fail to deliver adequate outcomes when it comes to cartoonization. This is because cartoon styles possess distinct traits characterized by high levels of abstraction and simplification. Additionally, cartoon images often feature distinct edges, smooth color shading, and relatively simple textures, all of which pose substantial obstacles for the texture-descriptor-based loss functions employed by current approaches.

Here, we present CartoonGAN, a GAN framework specifically designed for cartoon stylization. Our user-friendly approach uses cartoon images and unpaired photos for training. We present two new types of losses that work well with cartoons: one for semantic content loss, which is a sparse regularization in the VGG network's high-level feature maps that accounts for the huge style differences between cartoons and photos, and another for edge-promoting adversarial loss, which keeps edges sharp. Also, in order to make the network converge better to the target manifold, we add an initialization phase. Additionally, compared to other methods, ours is significantly easier to train. Our method outperforms state-of-the-art methods and can produce high-quality cartoon images from real-world photos, like specific artists' styles with smooth shading and clear edges. 12 "Aggressive generator nets," In our proposed approach to adversarial net generative model estimation, we train two models in parallel: a generative model G that describes the distribution of the data, and an adversarial model that predicts the likelihood that a sample was not generated by G but by the training data. Maximizing the likelihood of making an error is the training procedure for G. This structure is analogous to a two-player game with minimax objectives. A unique solution exists in the space of arbitrary functions G and D, where G recovers the distribution of the training data and De equals 1/2 everywhere. Back propagation can be used to train the entire system when G and D are defined by multilayer perceptrons. In order to train or generate samples, Markov chains or unrolled approximate inference networks are not required. By evaluating the produced samples both quantitatively and qualitatively, experiments show the framework's potential.

Making Cartoon Versions of Real-Life Images and Videos Presenting a method for converting static images or videos taken in the actual world into moving cartoons is the main objective of this project.An understanding of complex computer graphics and abilities is necessary for the previous method of transformation. The paper's central thesis is based on the artistic transformation of designated images and videos into a medium like painting. Cartoon GAN, a Generative Adversarial Network (GAN) application, will be utilized for the purpose of applying styles to real-world images. This network uses two loss functions—content loss and adversarial loss—to ensure that the final product is sharp and clear. Our Proposed Idea delivers high-quality cartooned images and videos, and the project development demonstrates that GAN can also convert video to its cartoonized version. "Improved Deep Residual Networks for SUPER-RESOLUTION of Single Images"With the advent of deep convolutional neural networks (DCNN), recent work on super-resolution has made headway. The performance of residual learning techniques is particularly enhanced. Our enhanced deep super-resolution network (EDSR) outperforms the state-of-the-art SR methods currently available. By optimizing conventional residual networks by removing unnecessary modules, our model achieves a significant performance improvement. Stabilizing the training procedure and increasing the modelsize both lead to better performance. Furthermore, we present a novel training method and multi-scale deep super-resolution system (MDSR) that can reconstruct high-resolution images with varying upscaling factors in a single 13-model setup.

By defeating state-of-the-art methods on benchmark datasets, the suggested methods demonstrate their superiority and claim victory in the NTIRE2017 Super-Resolution Challenge. "Improving the Response Time of Super-Resolution Convolutional Neural Networks," Super-Resolution Convolutional Neural Networks (SRCNNs) have shown to be more effective than earlier hand-crafted models in terms of restoration quality and speed when applied to image super-resolution (SR). Its high computational cost, however, prevents it from being used in practical applications that require real-time performance at 24 frames per second. In order to improve and speed up the current SRCNN, we suggest a condensed CNN structure in the shape of an hourglass for SR. Our primary focus in redesigning the SRCNN structure is on three areas. We start by adding an econvolution layer to the network's tail; next, we learn the mapping from the original low-resolution image to the high-resolution one directly, without interpolation. As a second step, we reduce the dimensionality of the input features before mapping and then expand them again to form the mapping layer. Third, even though we use more mapping layers, we use smaller filters. More than 40 times faster with even better restoration quality is achieved by the proposed model. We also detail the parameter settings that, when applied to a generic CPU, yield respectable real-time performance. For rapid testing and training across various scaling factors, a matching transfer strategy is also suggested.

3 SYSTEM DESIGN

System Design: Cartoonization of Images and Videos using GAN and OpenCV

1. Input Module: - Accept input images and videos from users or external sources. - Validate input data formats and properties. - Preprocess input data to ensure consistency (e.g., resize images, normalize pixel values).
2. GAN-based Cartoonization Model: - Design the architecture of the GAN model forimage-to-cartoon translation. - Train the GAN using paired or unpaired datasets of realimages and their corresponding cartoonversions. - Experiment with different GAN variants (e.g., Pix2Pix, CycleGAN) to find the most suitable architecture for cartoonization.
3. penCV Integration Module: - Utilize OpenCV for image and video processing tasks required for cartoonization. -Implementedge detection algorithms (e.g., Canny edge detector) to extract outlines. - Apply image filtering techniques (e.g., bilateral filter) to enhance cartoon-like features. - Integrate OpenCV functions for color manipulation and noise reduction.
4. Real-time Processing Module: - Optimize GAN inference and OpenCV operations for real-time or near real-time performance. - Utilize techniques such as batching, GPU acceleration, and parallel processing to improve processing speed. - Monitor system resource usage to ensure efficient performance.
5. User Interface Module: - Develop a user- friendly interface for interacting with the system. - Provide options for users to uploadimages or select videos for cartoonization. - Include sliders, dropdowns, or input fields toadjust cartoonization parameters (e.g., intensity, color palette). - Display preview of input and output images/videos to allow usersto visualize the effects of 19 cartoonization.
6. Output Generation Module: - Generate cartoonized images and videos based on user inputs and selected parameters. - Ensure the output retains the essential content of theinput while incorporating cartoon-like features. - Apply post-processing techniques to enhance the visual quality of the cartoonized output.
7. Quality Assessment Module: - Implement metrics for evaluating the quality of cartoonized outputs. - Consider factors such as perceptual quality, fidelity to cartoon aesthetics, and preservation of content. - Provide feedback to users on the quality of the generated cartoonized images/videos.

MODULES

1. IMAGE DENOISING

2. IMAGE UPSCALING

3. CARTOONIZATION OF IMAGEUSING GAN

4. CARTOONIZATION OF VIDEOSUSING GAN IMAGE DENOISING

Eliminating unwanted elements, often known as "image noise," is a fundamental problem in the domain of computer vision and image processing. Various intrinsic (i.e., sensor-related) and accidental (i.e., environmental) factors can also contribute to image noise. Image denoising is essential in many different applications for removing unwanted details from images. It is used in restoration, visual pursuit, image registration, segmentation, and classification, among many others. Suppressing noise from a version of the Image that is contaminated with noise is the fundamental goal in order to estimate the original image. A function called fast NlMeans Denoising is available in the OpenCV library that can be used to achieve this image denoising effect. Using the provided parameter to control the filter strength for the luminance component, the colored input transforms the image to CIELAB colorspace and then denoises the L and AB components independently.

IMAGE UPSCALING

You can scale a vector graphic image by 20 times using geometric transformations without sacrificing quality since it is based on graphic primitives. To scale a form ation graphics image, it is necessary to create a new image with either a higher or lower pixel variation. Periodically, there is a case where the image part is reduced (scaled down), which typically leads to a noticeable decline in quality. The two techniques which we applied are EDSR (Enhance Deep Super-Residual Network) and FSRCNN (Fast Super Residual Convolutional Neural Network). EDSR takes up to 120 seconds to upscale the image whereas FSRCNN is a faster technique andgivesanupscaled image output within 10 seconds. But comparison wise EDSR gives ahigher up scaled image than

FSRCNN CARTOONIZATION OFIMAGE USING GAN

The Image will be first Denoised and then it will follow the cartoonization Algorithm. Using the generator network, the animation complex can be mapped to input pictures in cartoonizing images. Following the model's preparation, cartoon stylization is executed. Two down-convolution squares are used to spatially compress and encode the images after the generator's first flat-level convolution stage. At this point, we separate the local signals that are valuable for further processing. In the next step, the substance and complex element are constructed using the eight remaining identical squares. Finally, two up-convolution blocks replicate the output cartoon-style images and up-scale them to improve the image quality.

CARTOONIZATION OF VIDEOS USING GAN

Whenever we give an input video for cartoonization, the video gets converted into frames and each frame is Cartoonized individually. The process of cartoonization for frames is same as that of images. Since thevideo gets converted into frames, loss of sound is observed. In order to aid this problem, we have come up with a method so that there will be no audio loss. Here we applytheconcept of multithreading. The input video will send its copy to the sound loss prevention and control unit so that the sound will be extracted from the video and anaudio file will be created. At the same time the process of dividing video into frames willtake place. Each frame will be Cartoonized. After the cartoonization of all the frames, theframes will be combined to form the Cartoonized video. At last both the outputs from Sound Loss Prevention ControlUnit and Video Cartoonizing unit will go through Sound Merging Algorithm where the audio and video will be merged. The output of this whole process would result in a Cartoonized video which will have sameaudio as that of the input video.

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OUTPUT SCREENS

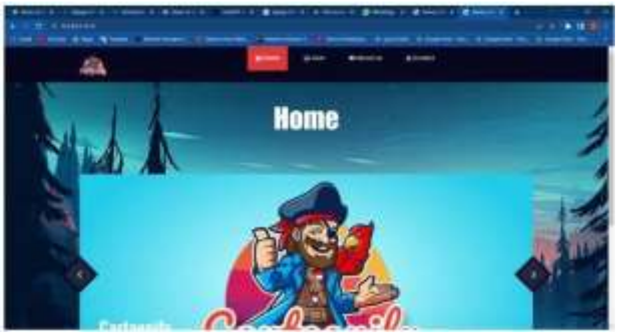

image no 2 home screen

image no 3 user login screen

image no 4 user register screen

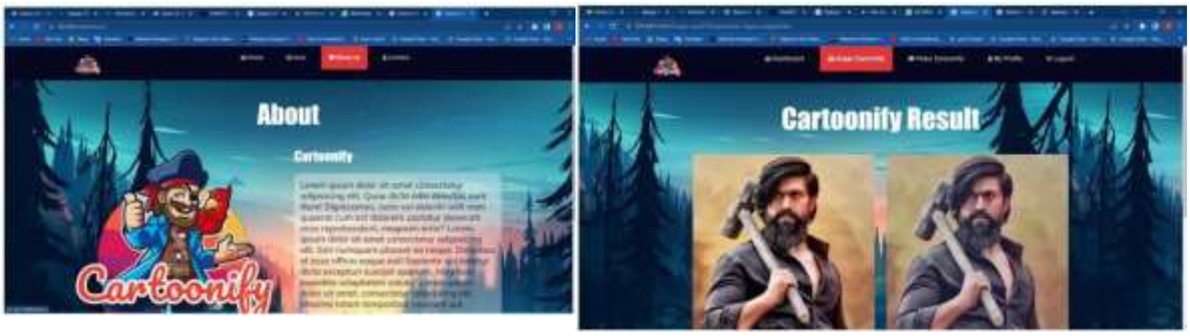

image no 5 about screen

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image no 6 contact screen

image no 7 dashboard screen*

image no 8: image cartoonify

CONCLUSION

The present methods for converting real- world images or videos into cartoon versions which were proposed by other systems compromise the quality of the image. In the case of video, the audio present in the video file is lost in the resultant cartoon version of the video. We aim to create a system that can use Generative Adversarial Models (GANs) to assist in the cartoonization of images and videos. The desired cartoonized image is generated by passing denoised real-world image files through a GANmodel. The video is animated by cutting it into several still images and then extracting the sound from each one at the same time. Each image frame is denoisedandpassed through the GAN to generate frames of cartoonizedimage. Those cartoonized image frames are aggregated and converted into video which is aggregatedwith the audio file to obtain the cartoonized videos. After the implementation of the project, the desiredcartoon version of imagesand videos was achieved. Also the loss of audio has been solvedusingthis approach. Hence, the GAN based Cartoonization modelhelps in saving time to convert thereal-time image/videos into their cartoon version with less noise andbetter quality.

FUTURE ENHANCEMENT

Future enhancements for cartoonization of images and videos using GAN and OpenCV canfocuson improving various aspects ofthe system, including quality, efficiency, usability, and functionality. Here are some potential areas for enhancement: 1. Improved GAN Architectures: Explore and develop novel GAN architectures specifically tailored for cartoonization tasks. These architectures can better capture the characteristics of cartoon styles and produce higher-quality cartoonized outputs. 2. Fine- tuning and Transfer Learning: Investigate techniques for fine-tuning pre-trained GANmodels on specific cartoon styles or datasets. Additionally, explore transfer learning approache stoleverage knowledge from related tasks and domains. 3. Semantic Understanding: Incorporate semantic understanding into the cartoonizationprocessto preserve the semantics and context of the input images and videos. This can help ensure that cartoonized outputs remain faithful to the original content. 4. Interactive Cartoonization: Implement interactive features that allow users to guide the cartoonization process in real-time. For example, users could provide feedback ormake adjustments during the cartoonization process to achieve desired results. 5. Style Transfer and Fusion: Explore techniques for style transfer and fusion to enable users to apply various cartoon styles or combine multiple styles in the cartoonization process. This can enhance creativity and artistic expression. 6. Multi-Modal Cartoonization: Extend the system to support multi-modal cartoonization, where users can choose from different cartoon styles or even specify custom style preferences. This can cater to a wider range of artistic preferences and applications. By focusing on these future enhancements, the cartoonization system can evolve to meet the growing demands for high-quality, efficient and user-friendly cartoonization solutions across various domains and applications. 38