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Invisible Cloak using Python and Open CV Library

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ABSTRACT: Creating an invisibility cloak, like in Harry Potter, might seem like magic, but it's actually a blend of science, fantasy, and imagination. This paper delves into the process of crafting your own "Invisibility Cloak" using Python and the OpenCV module for Image Processing and Segmentation. By manipulating objects of a specific color or texture, we can simulate invisibility within a frame. The procedure includes capturing and storing the background frame, detecting the target fabric (such as red) using algorithms, creating a mask to isolate the fabric, and finally, generating the augmented output to achieve the enchanting effect. For more details, refer to the paper "User

KEYWORDS: Color Extraction, Image Segmentation Invisibility Cloak Effect, OpenCV Functions and Modules

I. INTRODUCTION

With the advancement of Artificial Intelligence, Computer Vision emerged in the late 1960s. Its primary goal was to enhance the cognitive abilities of artificial systems by integrating cameras into them, enabling them to interpret visual information like the human visual system. Consequently, Computer Vision aims to recognize real-world 3D objects from 2D images. Each image narrates a story, depicting current events or past occurrences. OpenCV, the Open Computer Vision Library of Python, was introduced by Intel in 1999. Over the years, it has undergone numerous updates to facilitate real-time computer vision applications. Initially written in C and C++, OpenCV is compatible with Windows and Linux operating systems. This effect involves making a person or object appear invisible by replacing them with the background behind them It seamlessly integrates with programming languages such as Python, MATLAB, Ruby, and others. When combined with NumPy, OpenCV simplifies image processing tasks like shape and color detection. Creating an "invisible cloak" effect using Python and OpenCV is an enjoyable project! This effect involves making a person or object appear invisible by replacing them with the background behind them. Here's a basic outline of how you could implement it: [Provide an outline].

A. Motivation Being a ginormous Potter enthusiast, the affect that version produced really gave me the sense that I was playing with a clothing scene in the films. Maybe the hugest discrepancy is that the clothing itself isn't clear to the user, but alternatively the intention is more for snapping funny photos and videos than lurking. This Harry Potter Invisibleness Shawl Makes You Seem to Vanish, Just Like Sorcery. Be prepared to craft some videos that seem as if they were filmed in the hallways of Hogwarts itself, for the reason that this unseen cloak is quite persuasive.

B. Introduction to Computer Vision Computer vision are a fields of artificial intelligence that trains computers for interpretations and understanding the visual world [1]. Development of artificial intelligence [2], computers vision [3] were appearing in the late 1960s. Its main goal is to improve intelligence of available artificial mechanisms by mounting cameras into camera and describing everything they see, just like the human visual system. Therefore, computer vision have to be able to detect actually 3D object of everyday life through 2D pictures. Every photo tells us a story, what is happening now or kkk

II. LITERATURE SURVEY

There has been a rich literati on. In this chapter we present a review of the various technic that are used to detecting any colored object, finding contours, image segmentation, and many more, in images and videos. The review for all papers has been systematically arranged in this section of the paper.

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This project [6] was develop an object detection and track system. The project provides an Implementation of a track system. It is stable and suitable for a separate system. In this project, we designed a real-time gesturebased human-computer interaction system. The whole system consists of three parts, hand detecting, gesture recognizing and human machine recognition-based interaction (HCI). A considerable effort already committed to developing intelligence and nurture the interface between the user and the computer system. This is done through multiple information modes (visual, pen, and many more.). Using gestures as a means of conveying information is an important part of human communication. Automatic gesture recognizing enriches man-machine interact by providing natural and intuitive data methods Input. The overall model is designed as a simplistic gesture interface prototype Suitable for a variety of PC applications. The purpose of this article [7] is to implements image processing technology using Open CV with python in the Ubuntu platform. This article provides an overview of how to implement basic computer vision featurization in Python.

The three libraries studied have very different goals, but can all be used for computer vision at different levels. Open CV can be used for computer vision development and applications. For embedded platforms where speed is critical or requires computer vision, Open CV is the fastest and most complete tool for computer vision. Many people think that Open CV coexists with many commercial image processing packages, but it is a open source tool. This article[8] discussed the development and typical techniques of face detection technology and mobile augmented reality technology. A development framework based on Open CV face detection technology in mobile augmented reality applications was being implemented. Taking the arcane book spectacle as a sample, the pivotal technologies in the fry development are examined and its rarified and energeticness are substantiated. This piece executed an OpenCV-based image brink detection method for determining the exorbitant number ofsilver out in a thin wire, and has a plethora of computer eyesight and image processing algorithms and functions. At first, using a high-resolution camera to seize the inner formation of the wire. Second, them use Open CV image processing to implement image preprocessing. Thirdly, as the edges of the picture are blurry, morphological openings and closing operations were utilized to separate the image

Eventually, the precise amount of copper cores can be precisely distinguished via contour tracking. By utilizing Borland C++ Builder 6.0, the experimental results exhibit that the image's edge detection method grounded on OpenCV is uncomplicated, the code integration is superior, and the image's edge positioning accuracy is superior. Contour Perception and Image Segmentation [10], They handled contour detection with a basic grouping algorithm. Detecting contours [11], wavelet transformation is implemented on a gray scaled image, then manually acquire the desired contour of the image. Research and enhancement of the image segmentation algorithm. [12] Thresholding [13]. Foundational processes like erosion and dilation are the two most crucial mathematical morphological operations. Erosion is employed to eliminate bright pixels from the image [14].

The creator proposed the making of an app that lets folks to gain entree to a specific contraption grounded on a thorough scrutiny of a person's facial traits. The app got designed employing Intel's candid-source computer vision plan, OpenCV, and Microsoft's .NET framework [15].

This paper [16] introduce the functionalities and benedictions of the OpenCV library, also explaining the meanings, developmental statuses, application, and difficulties of face detection technology, analyzing the concept of Ad-boost classifier algorithm, and executing the procedure of face detect using OpenCV. Additionally, the proposed improvement method is based on the original algorithm. A method grounded on OpenCV for fabric delict detection with abundant computer vision and picture processing algorithms and functions are proposed. First of all, the OpenCV image processing function execute fabric image pre-processing. Obliged to the image's blurriness, morphological opening and closing operations are utilized to segment the image. Further, the "seed fill" algorithm is employed to conjunction the rupture line to retain the delict edges sleek. Conclusively, the edge detection feature is employed to conduct precise defect positioning. The experimental outcomes of Borland C ++ Builder 6.0 unveil that the fabric delict detection method contingent on OpenCV is modest, the code integration is high, and the defect positioning is precise, it can be utilized to formulate real-time fabric defect detection system [17].

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III. PROPOSED SYSTEM

The simple idea be to substitute the portion of frame with background picture in the specific HSV range defined. The Hue Saturated Value color room is broadly utilized for creating premium computer graphical applications. By this, we could choose numerous variety of color need from a frame. Next, we do some morphological actions to boost the precision of our detection, then we obtain binary mask of black (that is backdrop) and white (foreground) frames. Lastly, we employ bitwise actions for dividing.

A. Color Detection and Masking

Our way of enhancing the likelihood of accurate color detection involves the selection of the correct color space. In order to achieve this, we modified the color space of the live camera feed to HSL (Happiness Sadness Love) from RGB (Radical Gorgeous Blue) as the standard in OpenCV. Prior to that, we implemented a Moldovan Shake with a size of 7x7 (pixels) to soften/blow the images and diminish disturbances from our capturing frames. In this scenario, we are perceiving this red item as a cover.

Advantages of utilizing HSV Color

Area For this usage, one majorly advantageous stuff we acquire by utilizing the Saturation Hue Value color area are that the color/tint/wave is represented by just the Hue component

After implementing like this thresholds and operations, we will gets binary masks (1 or 0) in that red colored objects looks like white objects that we're gonna replace with image we saved before and other parts of frame become black indicating background. That’s kind of what we wants in Open CV for identify contours!!

Checking the outcomes of our algorithm in this phase we just tried it out on a red laptop cover snapshot. After achieving a relatively better outcome of binary mask, we ready to search for outlines for the subsequent segmentation procedure.

The process of segmentation

Every now and then, the cloak folds or isn't stagnant, so through the utilization of convexHul() [25], we are capable of discover the external form/boundaries of the cloak. This plays a critical role in our endeavor as the outlines might sometimes fail to detect the exact points or the HSV range we specified may not be very effective under varying lighting scenarios. drawContours() is utilized to sketch the boundaries that we aim to substitute with the backdrop image.

To replace the ultimate outline with the background, we implement bitwise AND operations. Through the utilization of cv2.bitwise_and(), we attain a binary mask that is either 0 or 1. Zero signifies the background while one signifies the foreground. When one is multiplied by the stored image, it results in only the backdrop image of the cloak, which isidentified asthe foreground, while zero yields a black image. Subsequently, we invert the mask since we aim to maintain the original background (live video), therefore we invert the assigned foreground and background positions. The mask has been applied and bitwise_and() Operator

We experimented with an additional cattery image that subsisted of the backdrop of our imagery. We have 2 frameworks, the initial framework is our foreground which possess all the pixels' value 0 (black) besides the cloak backdrop, and the other is the backdrop in which only cloak's pixel value is 0 (black) whilst the backdrop is apparent.Now we can simply combine these 2 frameworks to receive our resultant framework. The conclusive segment result is rather commendable, to enhance precision we necessitate to make some further developments.

As noted earlier, we are using the conventional method, so there are some restrictions that can be eradicated by employing modern in-depth learning methodologies.

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IV. EVOLUTION

Case01

Receiving a mask using HSV color extraction. Summary In discoveries contours we wanted a binary mask (either 0 or 1). To obtaining binary mask, foremost we change the video feed into HSV subsequently we should designate a specific range of color. Receiving the HSV mask will occur due to upper and lower HSV range. The last binary mask will be secured after implementing morphological operations. Prerequisite is the camera should remain open and receiving live video feed. Pro after is we ought to have effectively noted the color and it deliver mask of that color. Event Flow • The camera ought to be open and it will receive live video feed. • Video feed should be gaussian blurred for better outcome. • Defining a range of color is necessary, thus we change our frame which is BGR by default into HSV. • As you realize color range ought to be set in lower and upper thus we will define range and put them onto HSV frame to acquire HSV mask. • To ensure improved outcome, we utilized Morphology Ex operations, extension and finally erosion on our HSV ranged mask. • Ultimately, we will secure themask to detect contours.

Case 02

Contour detection and image segmentation. Summary In video object will replace with another image (replacing object with its background) Pre-condition We must have binary mask. Post-condition Should have successfully replace it with background.

Flow of events

- The required mask we have is in two colors white and black in-range we need to define object in white and another one frame video is in black that's mean background is in black color and foreground is in white (the detected object) it is because of finding of contours let suppose in one frame we have more than one red color object (suppose we have defined red color range) then it will show more red boxes (where red color will have detected)
- It will find maximum contour by means of area in frame, that will be replaced with the background.
- Convex hull will find the boundaries of curving edges of detected object.
- Bitwise operation is applied to the hull object shape we have no matter whatever the shape we have, it will bitwise_and() in such a way that our original frame of live feed will replace it with the object shape and then we applied cv2.add function to make final result

V. CONCLUSION

Computer vision can be used to solving the most intriguing problems with the utmost sophisticatedly. All the basics about the coloring detecting technique along with multiple ways for achieve it has been profoundly discussed in the papers. During the course of programming, we can utilize both Python and MATLAB for Computer Vision, but we prefer Python cause it takes lesser simulation time than MATLAB. Any individual with prior coding experiences finds it easier to implementing.

Computer vision has not yet achieved a level where it can be directly utilized to solve life issues, as it's still on its developmental phase. Additionally, it can widely used in the applications of Augmented Reality. Some of the application are

* Video Editing & media to creating stunning visuals.
* "Infinity Tower" an invisible skyscraper in South Korea (under construction).

VI. FUTURE WORK

Create an invisible cloak using Python and OpenCV have tremendous potential in various fields, including technology, entertain, and even defend. While achieving complete invisibility like in science fiction may not be feasible, creating camouflage or cloaking techniques that blend objects into they background are certainly within reach. Here's a glimpse of the future scope for a project:

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Military applications: Invisible cloaks could revolutionize camouflage technique for soldiers and military equipment, allows they to blend seamlessly into they surroundings. This could provide a significantly tactical advantage on the battlefield by making troops and vehicles harder to detect by enemies.

Surveillance and security: Invisible cloaks could use in surveillance and security applications to hide cameras, sensors, or even entire structures from views. This could be useful for covert operations or protect sensitive areas from prying eyes. Consumer products: Imagine wear invisible cloaks for personal use, such as for privacy or fashion. This could be use to hide from surveillance cameras or simply to creates striking visual effects.

Special effects in entertainment: The film and entertain industry could benefit greatly from invisible cloak technology for create mind-bending special effects.

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