

A PROJECT REPORT
ON
Image segmentation & Invisible Cloak
Using OpenCV

Submitted In Partial Fulfillment of the Requirement for the Award of

Post Graduate Diploma in Artificial Intelligence (PG-DAI)

Under the Guidance of

MR. NIMESH DAGUR

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CERTIFICATE

CDAC, NOIDA

This is to certify that Report **entitled “Image Segmentation & Invisible Cloak Using OpenCV”** which is submitted by Smita Joshi and Aafreen Khan in partial fulfillment of the requirement for the award of **Post Graduate Diploma in Artificial Intelligence (PG-DAI)** to **CDAC, Noida** is a record of the candidates own work carried out by them under my supervision.

The documentation embodies results of original work, and studies are carried out by the student themselves and the contents of the report do not form the basis for the award of any other degree to the candidate or to anybody else from this or any other University/Institution.

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ABSTRACT

Invisible Cloak is relatively known by Hollywood folklore, although they say it do occur in some fairy tales; with optical-camouflage technology the invisibility cloak is already a reality. Design and aesthetic are a powerful tool in getting us to accept new things and ideas. Within art, this can be used in a critical or subversive way. Every period and every technology need to develop its aesthetics in an organic relation to its own time. Instead of hiding technology we should use the power of design to visualize and express this real world.

In the past decade, people's interest in computer vision has grown. face detection and recognition has changed from esoteric concept to popular, One of the better and successful applications of computer vision research and image analysis and image analysis Algorithm-based understanding. In our work, we will be detecting contours (shapes) of various geometrical figures in the sample given binary mask extracted from HSV (Hue Saturation Value) range using Python 3.x(we used Python 3.9.6 in this project), Open-Source Computer Vision Library (OpenCV-4.5) and Numpy-1.19.2. The very fundamental functions are used for processing the frames, that involves getting live video loading them frame-by-frame, and detecting various shape of red colours inside the live feed frames and segment them with previously saved image with the exact same location. Here we discuss three primary problems of computer vision: Finding contours, detection of specified colour and segment with another image. We tried state-of-the-art algorithms for these three tasks. HSV colour extraction is used to get the mask of desire coloured object. In order to get high quality image segmentations results, we applied Morphological Transformation to refine the mask such as, opening which removes unnecessary details. We link this contour detector with Convex Hull, this strategy performs better than our existing image segmentation algorithms on measures of both boundary and segmentation quality. Finally, we replaced pixel value of red colour region detected by HSV mask with the pixel value of our background image with the help of bitwise operation to get the augmented result of invisible cloak.

INTRODUCTION

The concept of Invisible Cloak seems perfectly believable when you're reading or watching content about a fictional world filled with wizards, witches and centuries-old magic; but in the real world, such a garment would be impossible, right? Not so fast. With optical-camouflage technology the invisibility cloak is already a reality. Optical camouflage delivers a similar experience to Harry Potter's invisibility cloak, but using it requires a slightly more complicated arrangement.

Optical camouflage doesn't work by way of magic. It works by taking advantage of something called augmented-reality technology -- a type of technology that was first pioneered in the 1960s by Ivan Sutherland. Augmented-reality systems add computer-generated information to a user's sensory perceptions.

It is impossible to develop a cloak to become invisible in real world, it's all graphic tricks. **"When you are not a magician but still can-do magic with some lines of code"**. We achieve this magical experience using the technique called color detection and image segmentation.

PREREQUISITES

For working on this project, we need to know 3 things:

1) Python — 3.x (we used Python 3.9.6 in this project)

2) Numpy — 1.19.2

3) OpenCV — 4.5

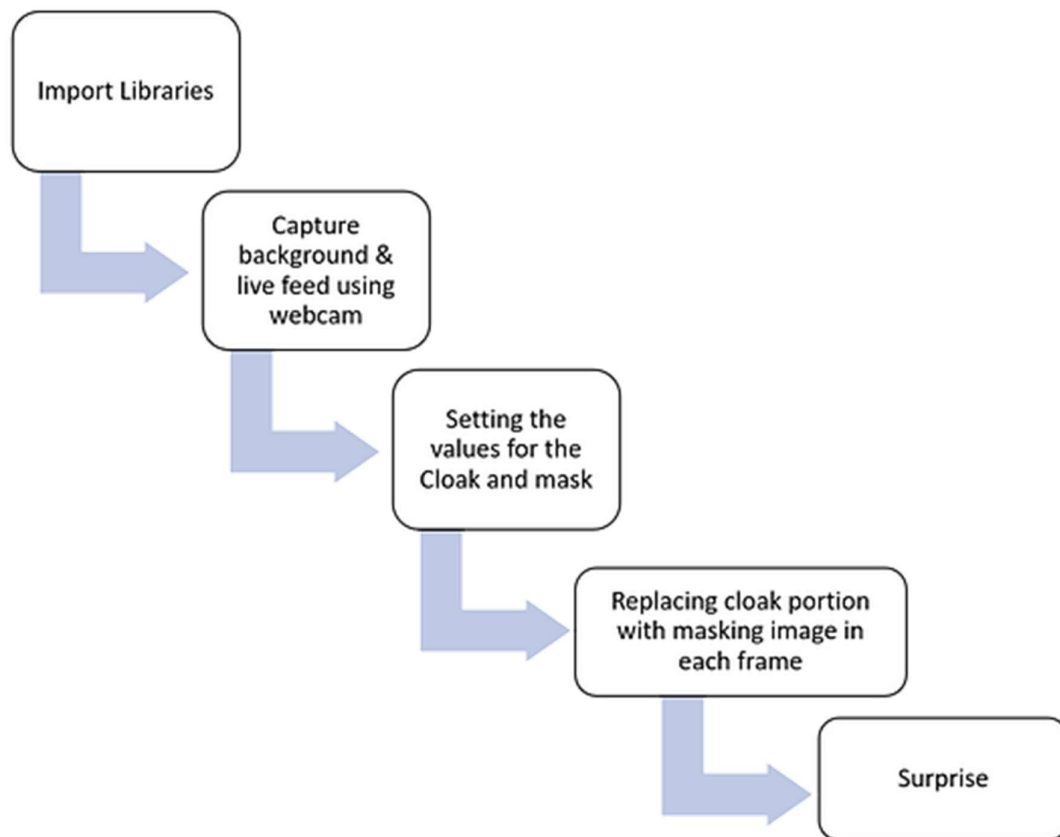
Prerequisites for the cloth:

- Choose a cloth of one colour only and suppose the colour of the cloth is red then ensure that your background does not contain any red colour. Because if the background contains that colour, then it will cause problems.
- In this project, we are using red colour cloth but you can make any colour we just have to change the values for the visibilities of the colour and it can be changed easily.

So, in this project, we are using VS code for making this Project but you can choose whatever you want it is up to you.

CODING

And now start writing code for project for code go with following flow.



Code flow

1.Importing needed libraries

```
# Import Libraries
import numpy as np
import cv2
import time
```

2. Recording and caching the background for each frame.

```
cap = cv2.VideoCapture(0)
time.sleep(2)
background = 0
```

3. Capturing background.

```
for i in range(50):
    ret, background = cap.read()
```

4.Read every frame & convert BGR->HSV , Setting values for cloak & mask.

Here we are Using Morphological Transformation to remove noise from cloth and unnecessary things.

Then combining mask and showing in one frame.

```
while(cap.isOpened()):
    ret, img = cap.read()
    if not ret:
        break
    hsv=cv2.cvtColor(img,cv2.COLOR_BGR2HSV)

    #all this Comes in the while loop
    lower_red = np.array([0,120,70])
    upper_red = np.array([10,255,255]) # values is for red colour Cloth
    mask1 = cv2.inRange(hsv, lower_red,upper_red)
```

```

lower_red = np.array([170,120,70])
upper_red = np.array([180,255,255])

mask2 = cv2.inRange(hsv,lower_red,upper_red)

#Combining the masks so that It can be viewed as in one frame
mask1 = mask1 +mask2
mask1 = cv2.morphologyEx(mask1,cv2.MORPH_OPEN,np.ones((3,3),np.uint8), iterations = 2)
mask1 = cv2.morphologyEx(mask1, cv2.MORPH_DILATE,np.ones((3,3),np.uint8), iterations = 1)

mask2 =cv2.bitwise_not(mask1)

res1 = cv2.bitwise_and(background,background,mask=mask1)

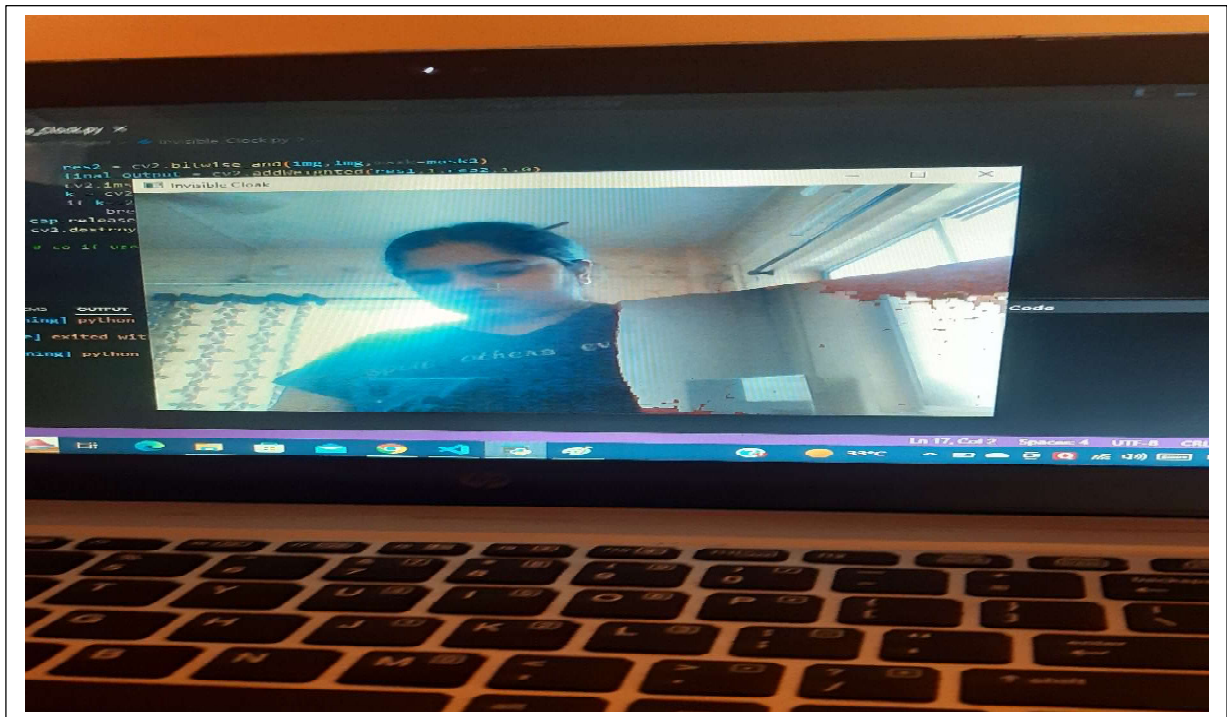
res2 = cv2.bitwise_and(img,img,mask=mask2)
final_output = cv2.addWeighted(res1,1,res2,1,0)
cv2.imshow('Invisible Cloak',final_output)
k = cv2.waitKey(10)
if k==27:
    break
cap.release()
cv2.destroyAllWindows()

# so if user want to quit the program they can press Escape key the 27 is the code for e

```

Important note: When you try to run this it takes 2 seconds to capture we selected in Step 2 time frame the background so try not to be in the frame in the first 2 seconds and then you can simply test out your project.

RESULT



CONCLUSION AND FUTURE SCOPE

In this project, we have implemented simple masking techniques and Morphological Operations to get the coloured cloth out of the frame and instead of that, we are showing the background.

OpenCV is a vast field and has many practical applications available in the industry like object detection, motion detection, facial recognition, and nowadays many organizations are using the same in the name of AI and Computer Vision for developing surveillance systems to keep track of criminal activities.

Another reason for its useful its execution speed and efficiency as compared to other image processing libraries. Once you dive into it, will open the way for many innovative ideas and fun projects like you can control a racing game with gloves in your hand or else you can be invisible in your online video classrooms and many more.

It will not be the real cloak but some ***graphical tricks with OpenCV and Python to make things invisible in front of the camera*** based on colour detection and colour segmentation techniques. The same has been done for an android camera using OpenCV and Python.

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