Principles of Computer Vision for AI

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# Part 1

## Stage 1

## Stage 2

In this stage of the assignment two functions where developed: removeGreen and changeBackground. The two functions operate similarly.

The process starts by converting the passed image, like Fig 1 to HSV colouring and then getting a mask of the green colours.

Icon

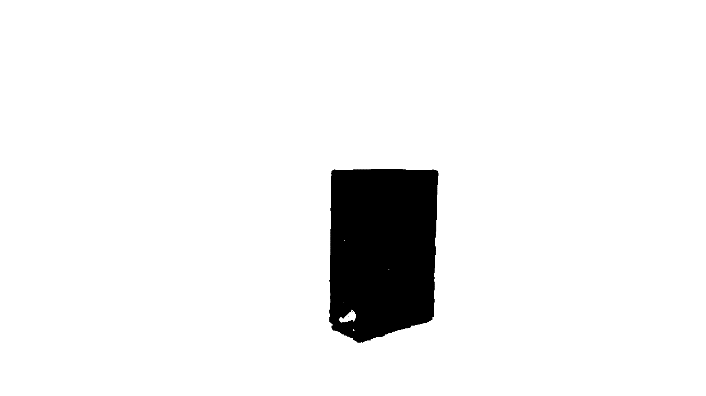
Description automatically generated with low confidenceGraphical user interface, website

Description automatically generated

Fig 1: COTS Dataset Book Image Fig 2: Green Mask of the input Image

When this mask is removed from the image the result is the green parts of the image as in Fig .2

Figs 3-6 shows the grayscaling of the result, thresholding, not operation and closing. Closing is done so that green within the objects in front of the greenscreen is included in this newly generated mask.

****A black cube on a white surface

Description automatically generated with medium confidence

Fig 3: Grayscaling of Fig 2 Fig 3: Binary Treshold of Fig 3

Icon

Description automatically generated with medium confidence**A picture containing icon

Description automatically generated**

Fig 4: Not Operation on Fig 3 Fig 6: Final Mask after Closing Morph

The final step is that every pixel in the passed image is checked. If the corresponding image from the new mask is not white then this pixel is set to black. The result is Fig 7.

A picture containing graphical user interface

Description automatically generated

Fig 7: Green Background Removed from input Image

In the case of changeBackground the final step differentiates by painting the object onto a new background instead of a black background like in Fig 8. For backgrounds larger than the passed image, the image will retain its original coordinates this can be seen in Fig 9.



Fig 8: Changed Background to 1280x720p Fig 9: Changed Background to 1920x1080p

Figs 10-11 show different source images have their background changed to different 1280x720p backgrounds. These figures also highlight an advantage and disadvantage of using the closing morph for the mask. In fig 10 the Ganesha figure features the god sitting on a green cushion, because of the closing morph this gets included in the final image. The green between the god’s hands and head, however, is also included. Similarly in fig 11, the green background can still be seen between the Buddha’s hand and torso.

Fig 9: Changed Background to 1280x720p using a different COTS image

Fig 9: Changed Background to 1280x720p using a different COTS image

# Part 2

## Task A

In this Task we were required to implement the [1]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Label | S2 | Mask | S1 | TELEA | NS |
| Statues |  |  |  |  |  |
| Shooter Glasses |  |  |  |  |  |
| Academic Books |  |  |  |  |  |
| Footwear |  |  |  |  |  |
| Mugs |  |  |  |  |  |
| Tech |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Label | SSD (Telea) | SSD (NS) | MSE (TELEA) | MSE (NS) |
| Statues | 487461624.0 | 496995348.0 | 42.20 | 42.31 |
| Shooter Glasses | 83845946.0 | 84640814.0 | 13.17 | 13.19 |
| Academic Books | 372850560.0 | 379575607.0 | 23.02 | 22.73 |
| Footwear | 87419718.0 | 96006167.0 | 17.64 | 17.57 |
| Mugs | 78877863.0 | 83528925.0 | 14.98 | 15.16 |
| Tech | 132791205.0 | 146494060.0 | 14.79 | 15.01 |

## Task B

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Label | S2 | Mask | S1 | TELEA | NS |
| Books A NW |  |  |  |  |  |
| Books A W |  |  |  |  |  |
| Bottles A NW |  |  |  |  |  |
| Bottles A W |  |  |  |  |  |
| Electronics A NW |  |  |  |  |  |
| Electronics A W |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Label | SSD (Telea) | SSD (NS) | MSE (TELEA) | MSE (NS) |
| Statues | 872725274.0 | 952867397.0 | 24.76 | 24.33 |
| Shooter Glasses | 967066154.0 | 1079077087.0 | 25.32 | 25.45 |
| Academic Books | 246319032.0 | 257172040.0 | 22.48 | 22.69 |
| Footwear | 1070677610.0 | 1108628015.0 | 34.39 | 34.37 |
| Mugs | 415069437.0 | 469780795.0 | 15.22 | 15.32 |
| Tech | 389166321.0 | 408671591.0 | 49.26 | 49.30 |