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# Image Processing

## Mini Course

This document depicts the different stages of the 'extraction function, written by thaddeus thomas.

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## Overview of the Four Major Image Processing Stages



The initial Image consist of the background (the two balls, floor and wall) and the 'Target', which is the 3 ton cast lion

Not shown is the background image, which is everything but the lion.



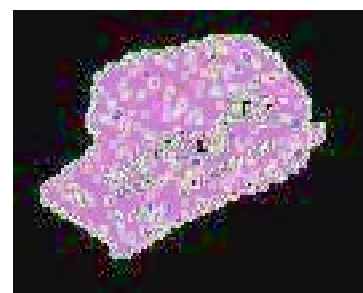
The first stage in processing is to balance the background color from the 'blank' image to the 'target' image. Then to subtract the pixels from the 'blank' image from the 'Target' image. This is were the ColorTolerance and Color Threshold parameters are used.



This image represents a composite of two processing steps: 1. convolution with a vertical edge detection filter, 2. convolution with a horizontal edge detection filter.

See next pages for more details.

Notice the black 'voids' this is were the edge detection did not find an edge. These area will not 'protect' the target from background color replacement.



This image shows the result from passing a blur filter over the above image. The purpose of the blur is to get ride of the black regions above that did not have edge detection. This 'image' becomes the mask and is used with the original 'target'.

A side effect of the blur is a 'halo' or 'shadow' around the edge of the 'target' object



The Initial Image is 'protected' by the mask, all other pixels are replaced by the new background color.

Note the 'halo' near the tail and below the 'target'.

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## Edge Detection Image Examples

This is the result of the Subtraction Only Procedure. As you can see there are colors on her (its a she gargoylle) that matched too close to the background color, so using simple subtraction is not always a solution.

These next four pages show a bit more the details involved with the image detection. The target for this captured images is the gargoylle.



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## Horizontal Edge Filter Output

The image on this page shows the edges detected by the HORIZONTAL filter, in blue.



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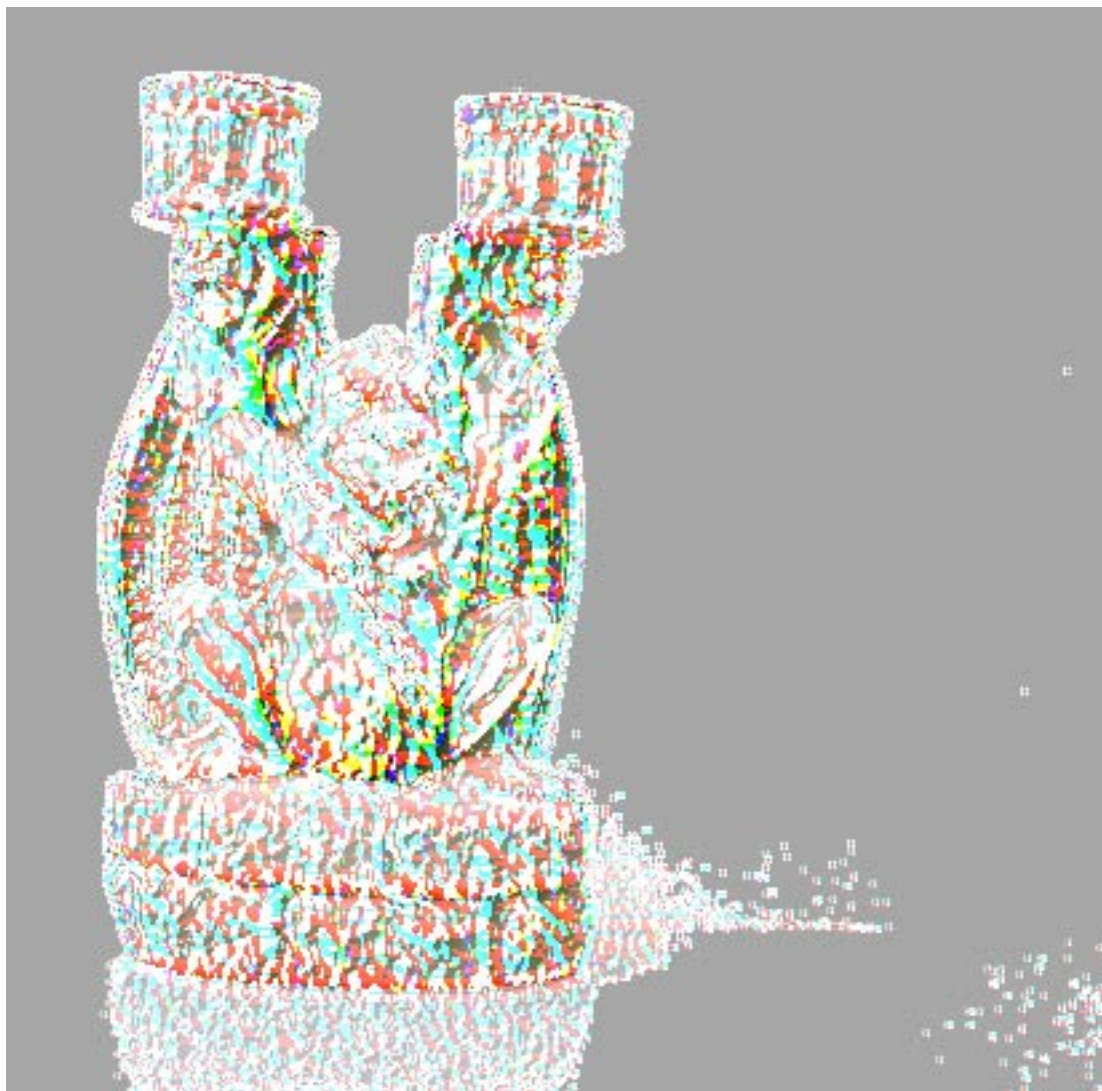
## Vertical Edge Filter Output

The red in this image are the edges detected by the VERTICAL edge detector.



## Combined Edges, Low Threshold, High Erosion

This is a merge of the Horizontal and Vertical detected images (by combineSymmetric). Note the cubes and the shadow below the gargoyle, this is due to the low Threshold value  $\{30,30,30\}$ . Note also that the combined edge 'ridges' are not forming a solid 'mass' but that there are a lot of regions that are not red or cyan. These combined edges won't form a good 'mask'.

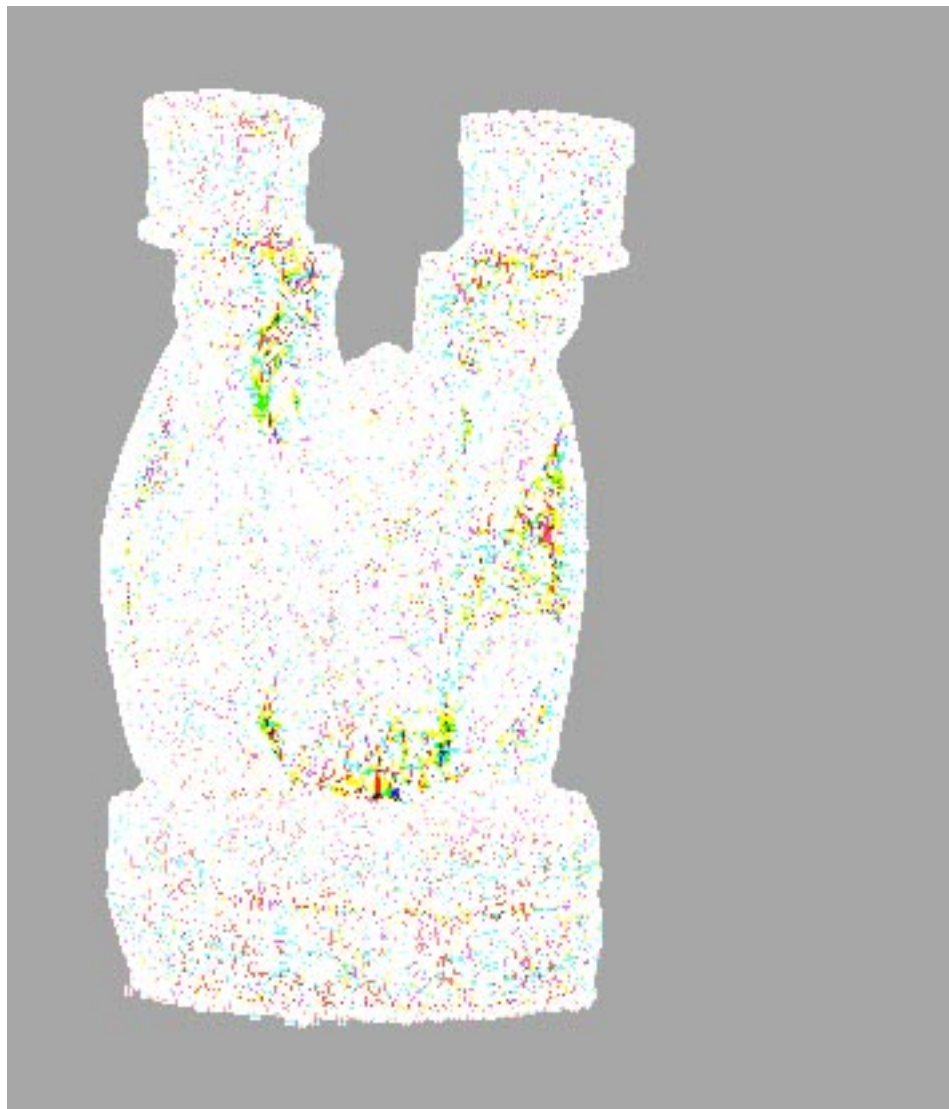


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## Combined Edge Ridges, Medium Threshold, Low Erosion (blurring)

This is another run, with the two combined edges (red and cyan), but in this run the Threshold level was increased (from 30 to 60) and the Edge Erosion was decreased (from 60 to 6) as compared to the previous picture.

This is a pretty good mask. The next stage in processing is to build from this a 'solid' mask.



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## Final Stages of Processing

There two images are from the final stages in processing. As you can see they need a bit of work!

This is where I left off at when preparing for the LA show and went back to adding the blur to the combined edge ridges

