

Project Checklist:

Major Modules:

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ZBT Interface (David):

The ZBT Interface module takes the data from the NTSC Camera and stores the full color data in the ZBT. The ZBT will then send the the pixel data to the Edge Detection and Color Reduction modules. This module can be checked by whether the NTSC to VGA path (with no additional filters) is functional and RGB video can be displayed. This module derives from an already implemented `zbt_6111_sample.v` code, which has grayscale output in place.

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RGB2Grayscale(Tarun):

The data is converted to intensity using the NTSC RGB-to-Y Value and the following weights are applied.:

$\text{Grayscale} = 0.3 * \text{red} + 0.59 * \text{green} + 0.11 * \text{blue}$

Grayscale will be the input to the Edge Detection module.

Edge Detection(Tarun):

The Edge Detection module uses a Sobel filter to isolate the edges in each video frame. This module must store a buffer of pixel values in order to mask the sobel filter on the pixels surrounding each pixel. This module can be tested by comparing the image data generated by Matlab to the output of the module.

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Color Reduction (Ariana):

Includes `rgb2hsv`, `colorReduction`, `thresholdSelection`, and `hsv2rgb` modules.

The Color Reduction module uses thresholding to decrease the number of colors in a frame of the video. Conversions to and from the HSV color space will be necessary to perform a more accurate color reduction and output values usable for the VGA. This module will also allow the user to input desired thresholds on the HSV color space reduction. This module can be tested by comparing the image data generated by Matlab to the output of the module.

Image Fuser (Ariana):

The Image Fuser module is in essence a mux choosing whether to display the pixel of the edge detected image or the pixel of the color reduced image. This module can be tested by comparing the image data generated by Matlab to the output of the module.

Supervisor (David):

The supervisor module will handle the clock synchronization between the NTSC clock and VGA clock, as well as regulating the movement of pixels from one module to another. The functionality

of this module can be tested by the functionality of the total project.

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ZBT1\_to\_ZBT2(David):

This module introduces appropriate amount of timing delay in order for the processing to be done in time. Assumed that ZBT1 stores the original pixel data from the camera and that ZBT2 stores the processed pixel values. Will first test this module by trying to store pixel-by-pixel color inversion into ZBT2.

Extension:

Halftone Filter

The Halftone Filter module would apply a halftone effect to the image based off of the gradient data calculated for each pixel

Some Ideas for possible extensions:

K-means algorithm for color reduction or another more involved algorithm

Additional Filtering