



The Video Vitalizer

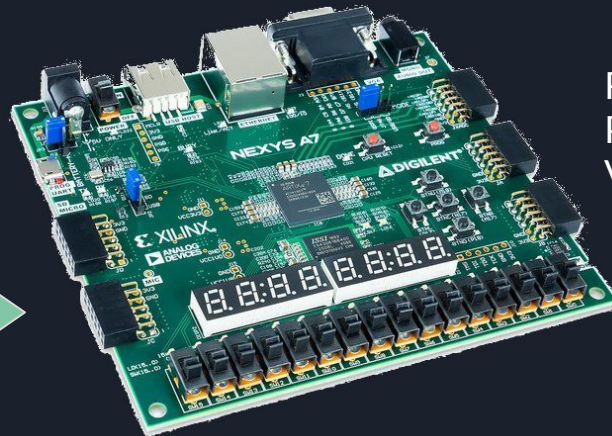
A system to receive, filter, and reconstruct
NTSC video signal in real time for drone
first-person video [FPV] applications

A 6.111 Final Project
By Jamie Abel and JT McGuire

Project Overview



NTSC
Video
Signal

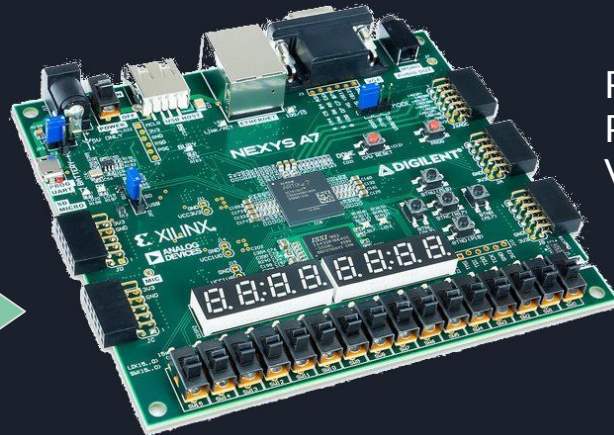


Real-Time
Processed
Video

Project Overview



NTSC
Video
Signal

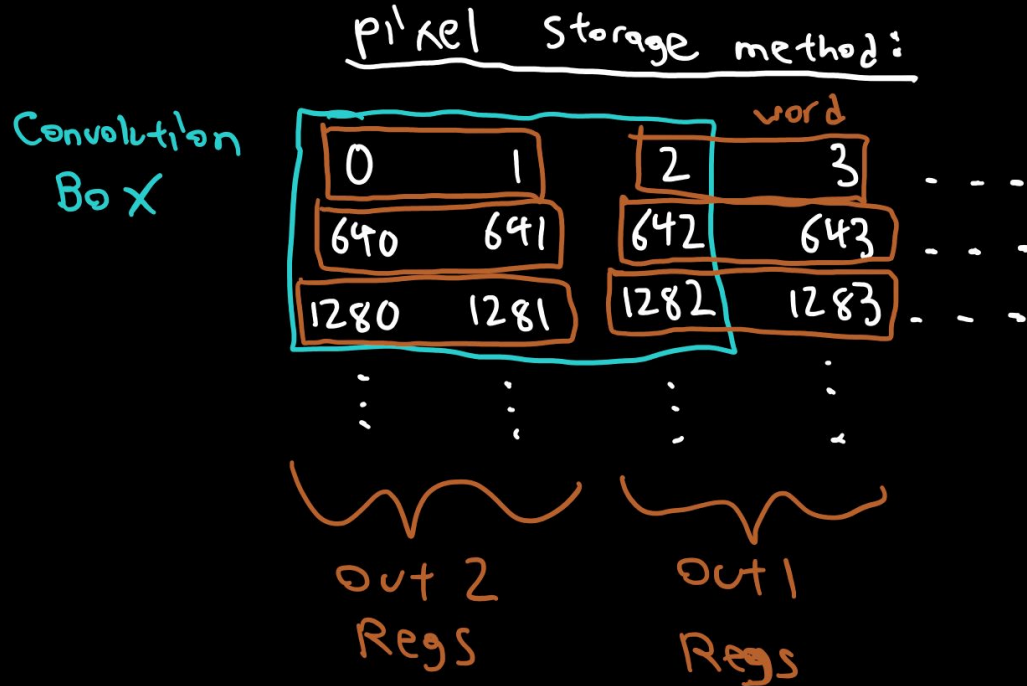


Real-Time
Processed
Video

Processing
Options:

- Level Adjustment
- Edge Highlighting
- Noise Removal
- Data Overlays

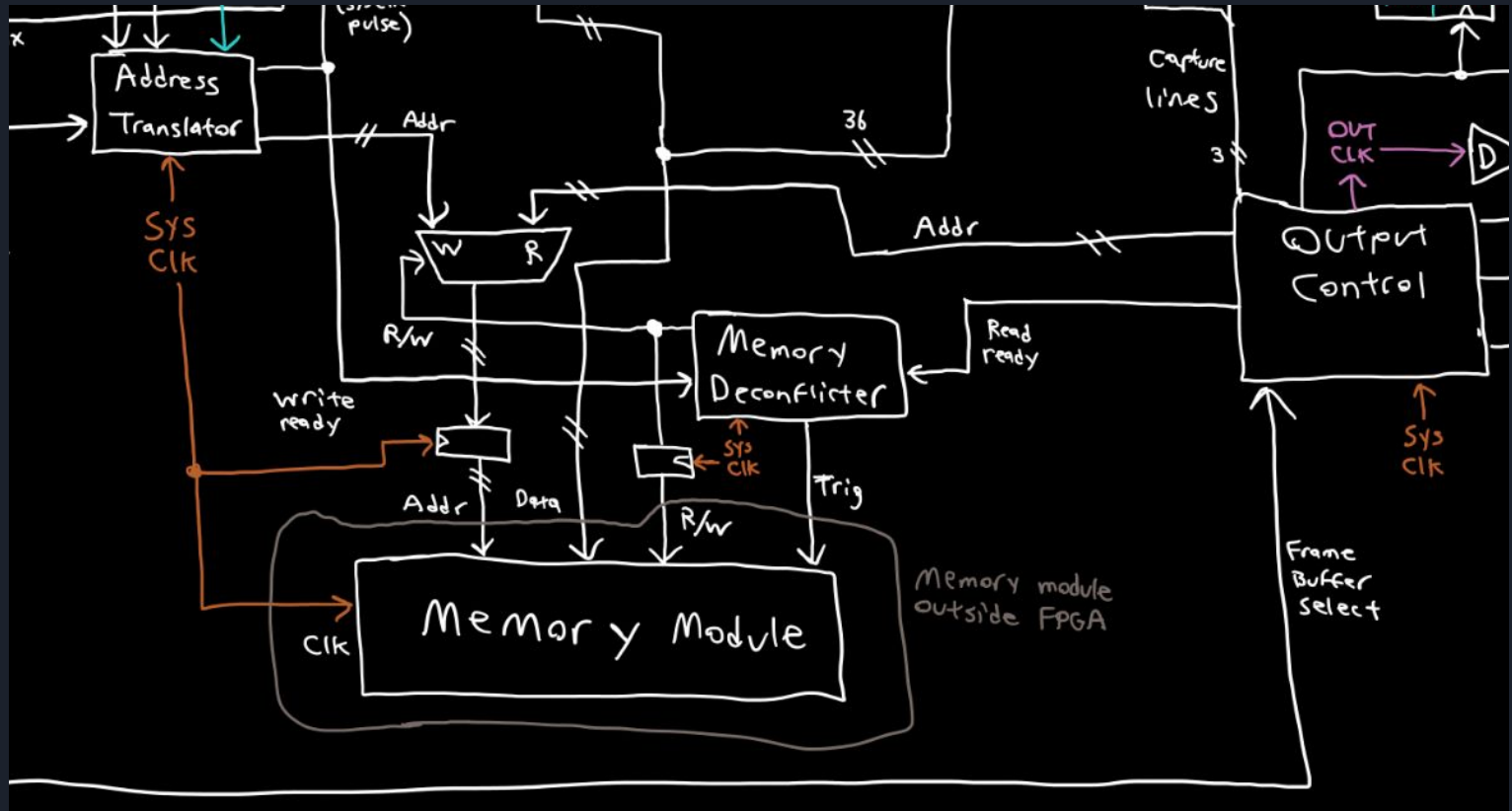
Convolution Buffer Storage Scheme



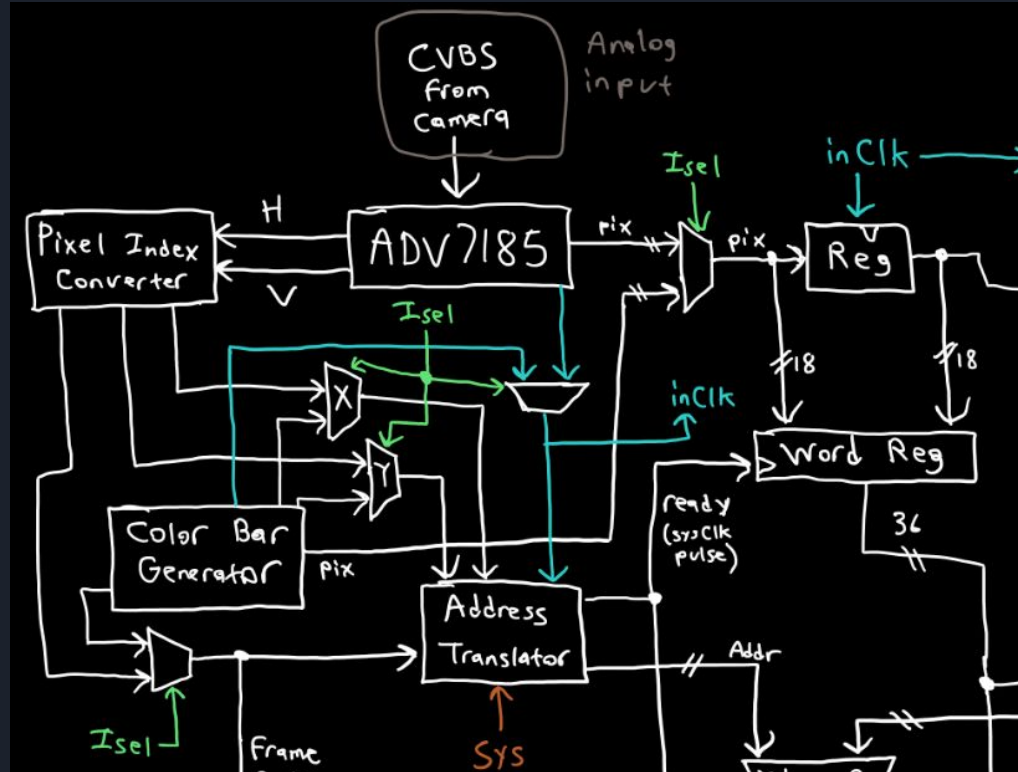
OUTPUT SCHEME FOR CONVOLUTION:

1	2	3
4	5	6
7	8	9

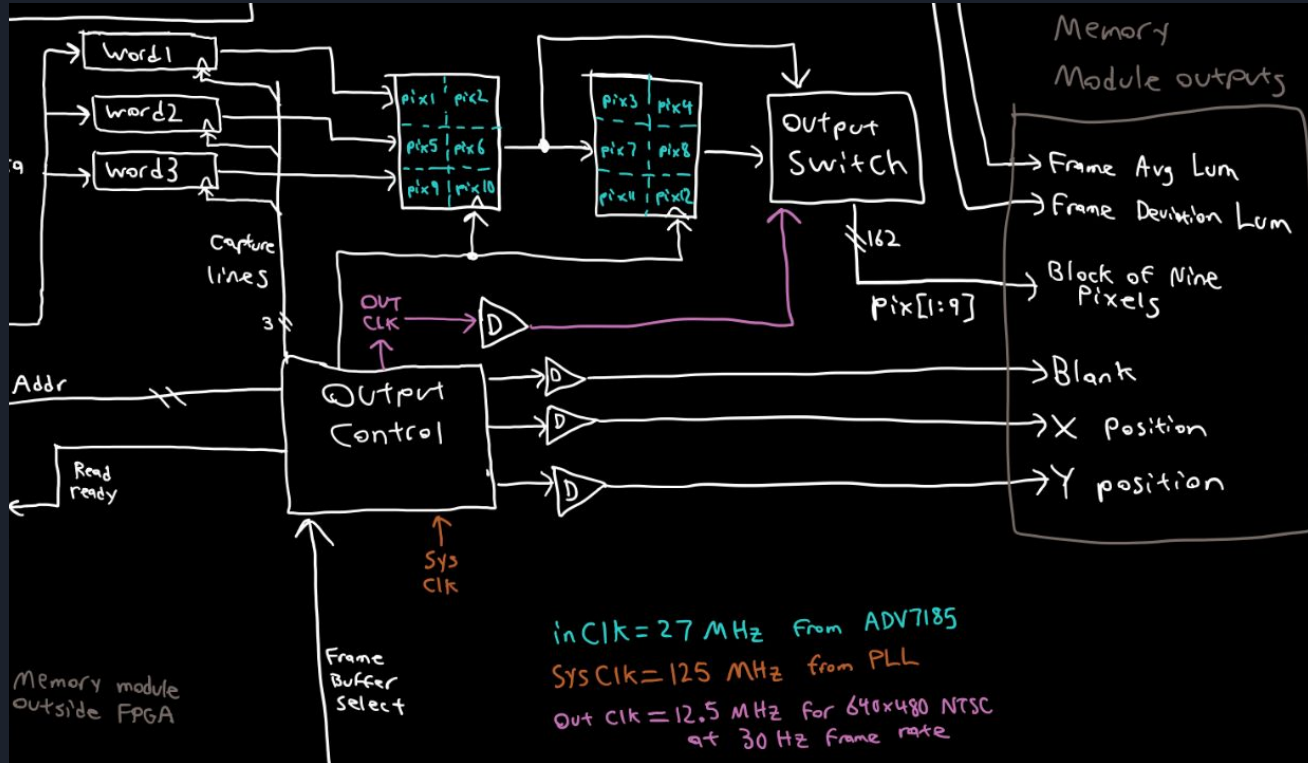
Memory Interface Explanation



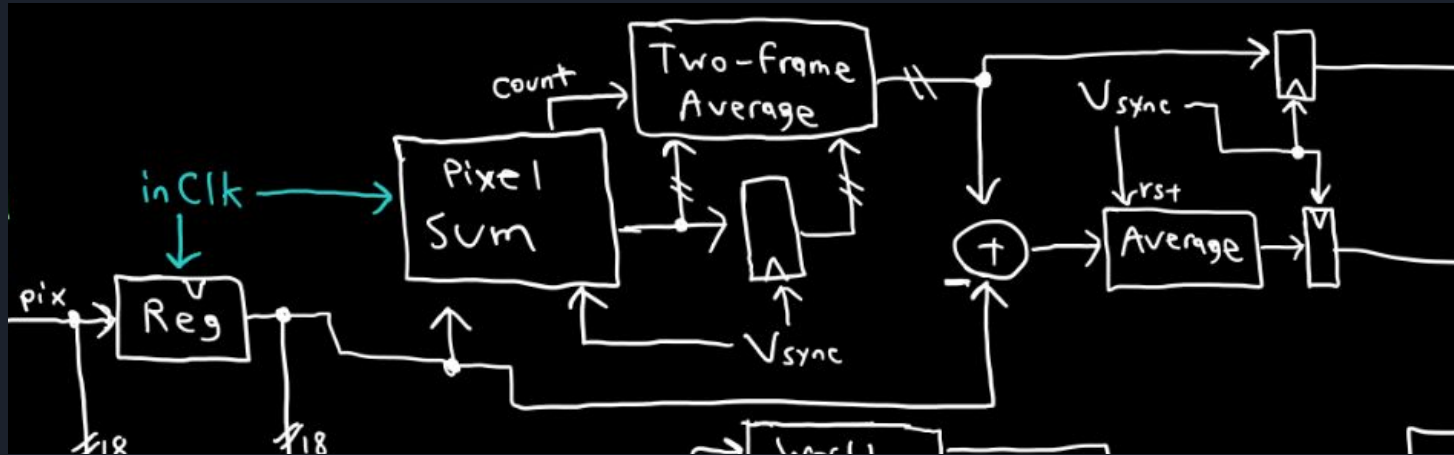
Input and Color Bar Generator Explanation



Output Control Explanation



Average and Deviation Computation Explanation



Block Diagram - Image Processing System

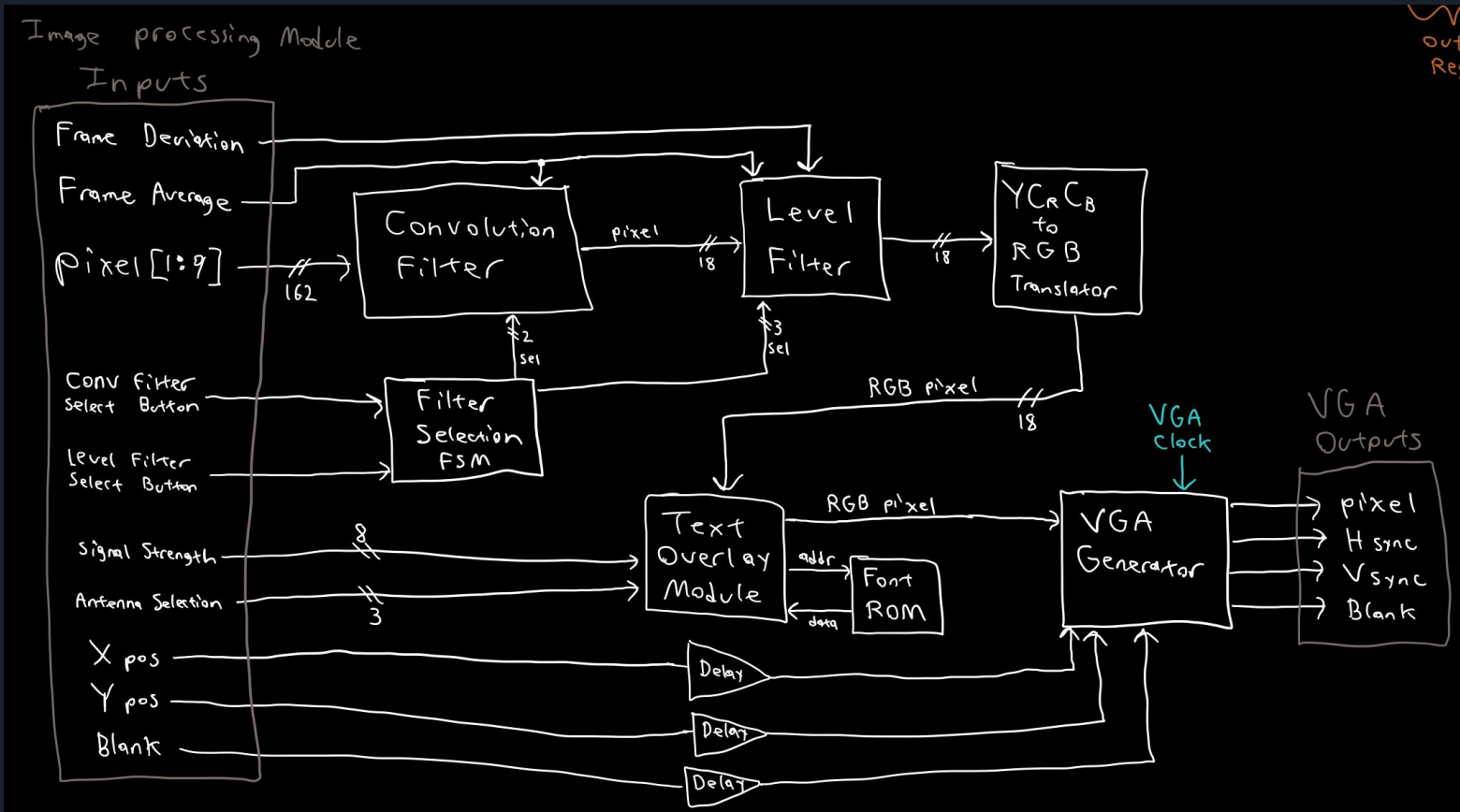
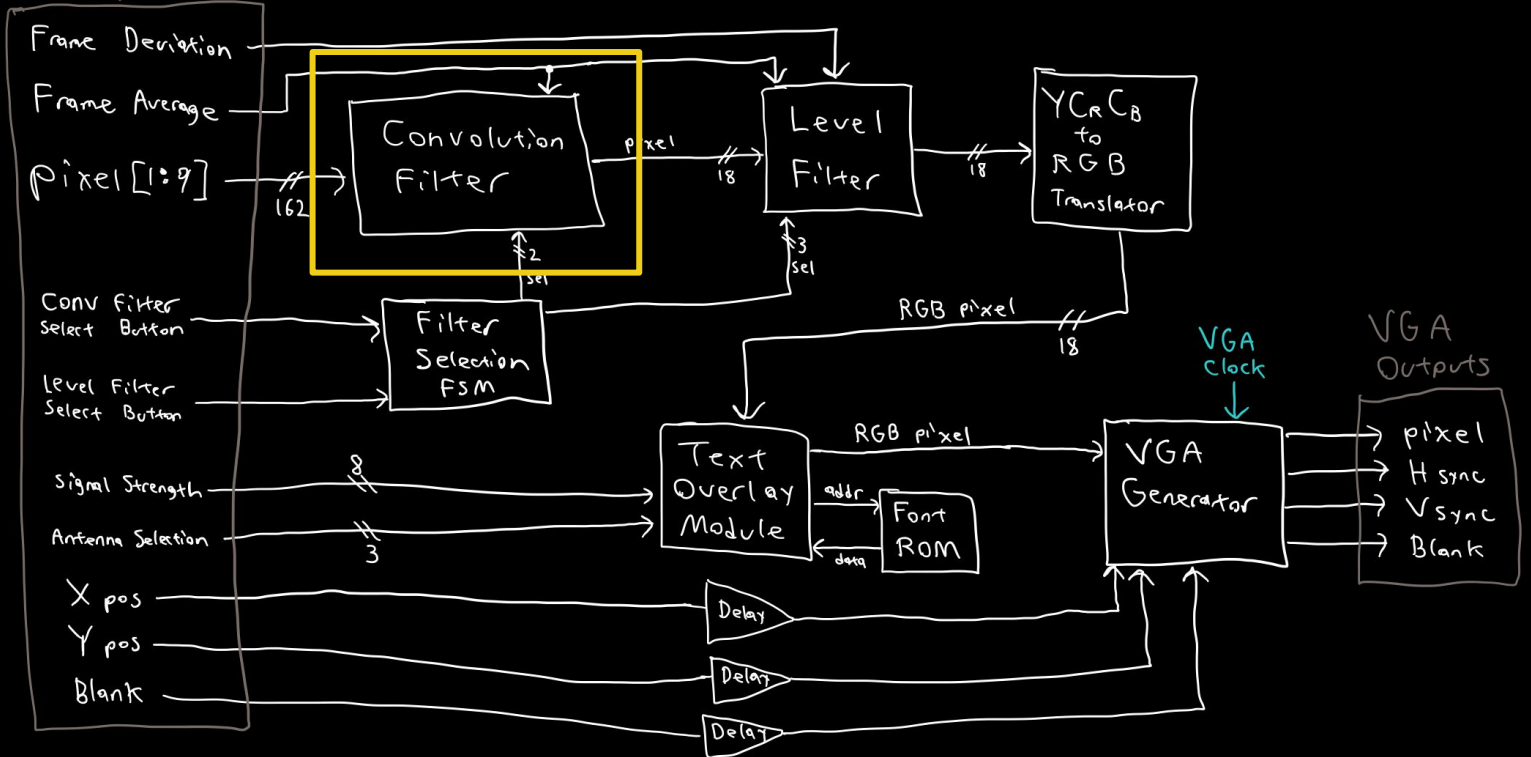


Image processing Module

Inputs



out
Re

Convolution Filters - Noise Removal



Use median filter to remove salt and pepper noise

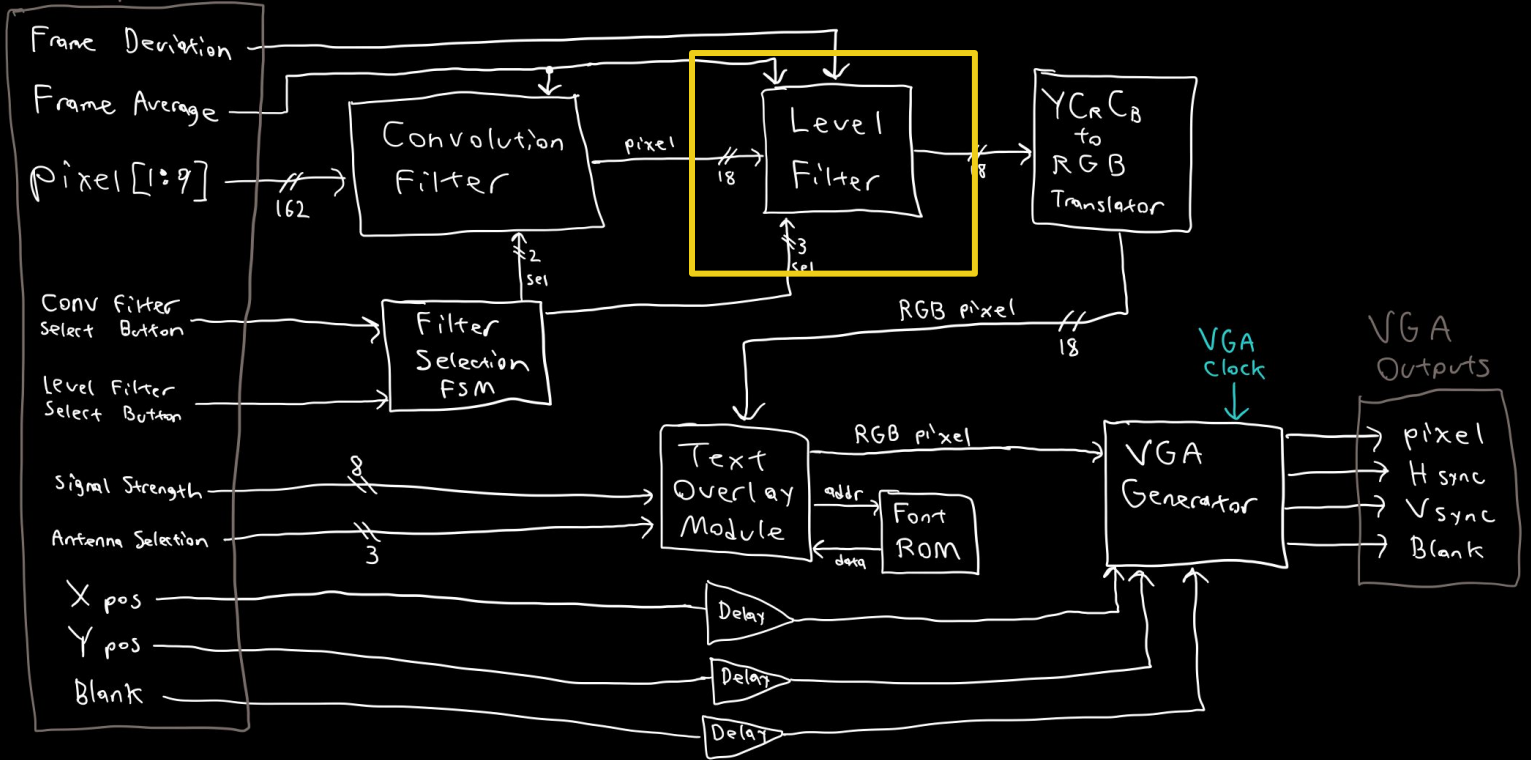
Convolution Filters - Edge Highlighting



Sobel edge filter to highlight obstacle edges for better visibility

Image processing Module

Inputs



out
Re

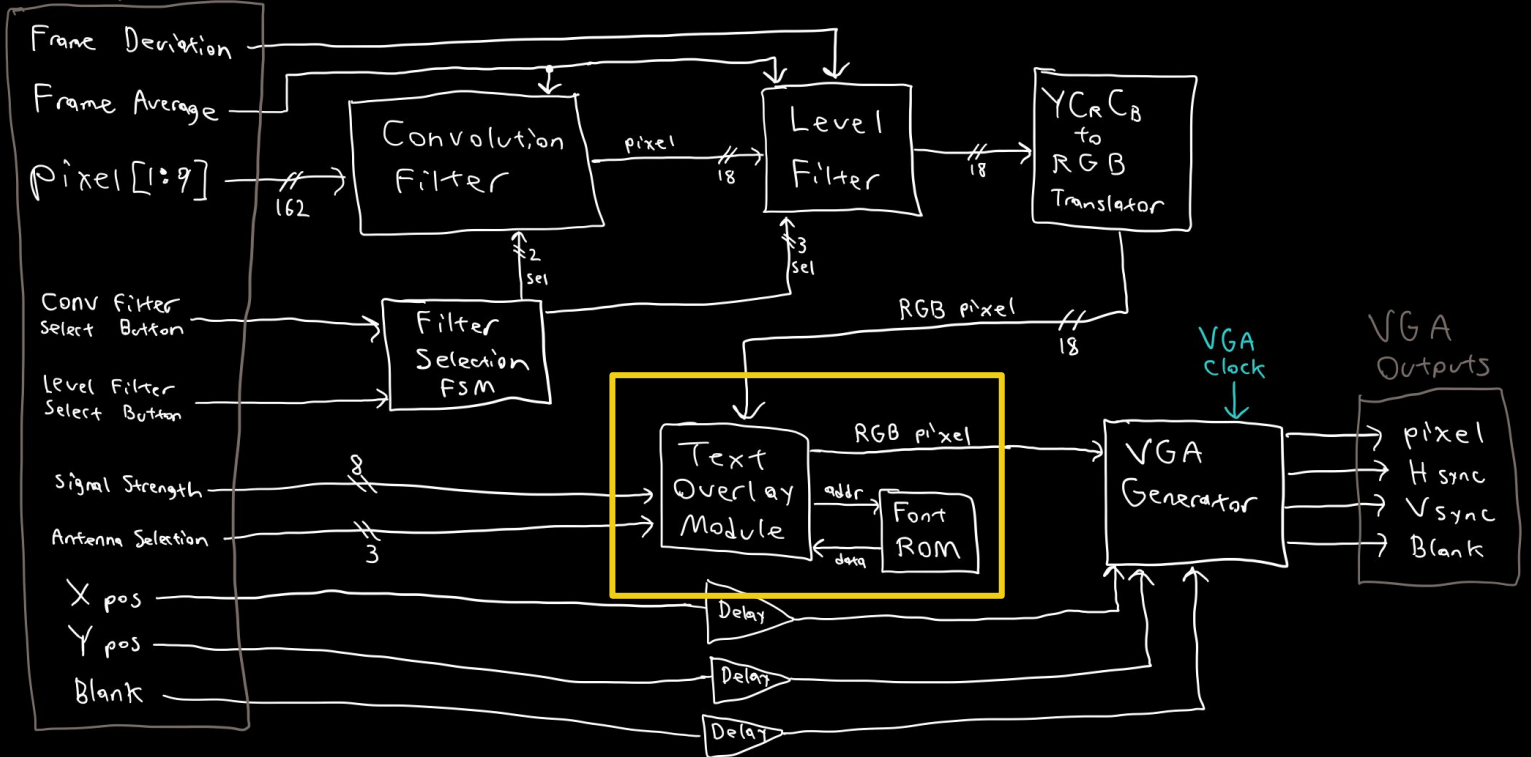
Level Adjustment



Linear remapping of Y channel values to increase contrast in adverse lighting

Image processing Module

Inputs



W
out
Re

Data Overlay



Display current filter state plus additional data (e.g. overall brightness, signal strength)

Timeline

Week of	J. Abel	J. McGuire
8 Nov	Design image filters in MATLAB, create sprites for overlay	Finalize block diagram and system-level design
15 Nov	Write VGA modules, level filters, test on static image	Write and test modules for ZBT memory interface w/ arbitrary values
22 Nov	Write convolution filters, filter control FSM, test as above	Write and test color bar and frame average/deviation modules
29 Nov*	Write data overlay module, image system test on static image	Write and test 9-pixel output buffers and modules
6 Dec	Integrate filters with live camera feed, memory controller	System integration and testing
13 Dec	System demo, report	System demo, report