

README and Design for Graphics Memory

This design for a simple graphics memory uses 40 BRAMs to implement a 640x480 image, with 2 bits/pixel. The BRAMs are 16-bits wide, so each write to a BRAM is writing 8 consecutive pixels. [see design on the following pages]

It is modified from Lab2 and uses video/scopeface to read from the graphics memory to display on the monitor through the HDMI port.

This Scopeface's ch1 and ch2 two accepts the 2 bits per pixel as:

- 00 Black
- 01 Red
- 10 Green
- 11 Blue

If you want Scopeface to always draw an unchanging static image (like a grid), it can use color black 00 to ignore the color and draw the scopeface.

If you want more colors, if you double this design to 80 BRAMs, you could have 4 bits/pixel, or 16 colors (defining the colors in Scopeface)

The bit file is included. If you'd like to build the project from the included files, you will need to recreate clock_wiz_0 similar to lab1.

The hardware FSM is set up to run a test image:

- Let exSel = '0' in graphics.vhd to run the test.

- It boots up with a test image, then writes a test pattern of blue, green, and red strips, then blanks the screen, then repeats the pattern.

- The FSM has a delay (using a counter) between writes, so this can write much faster if you decrease the delay count.

To Use with MicroBlaze:

- Set up slv_regs to write to exSel, exRow, exCol, exData, and exWen

- Initialize exSel <= '1'

- For each set of 8 pixels to write, let

- exRow <= the row to write to

- exCol <= the column to write to

- exData <= the 8 pixels in a 16-bit word

- '00 01 10 11 00 01 10 11' is Black Red Green Blue Black Red Green Blue

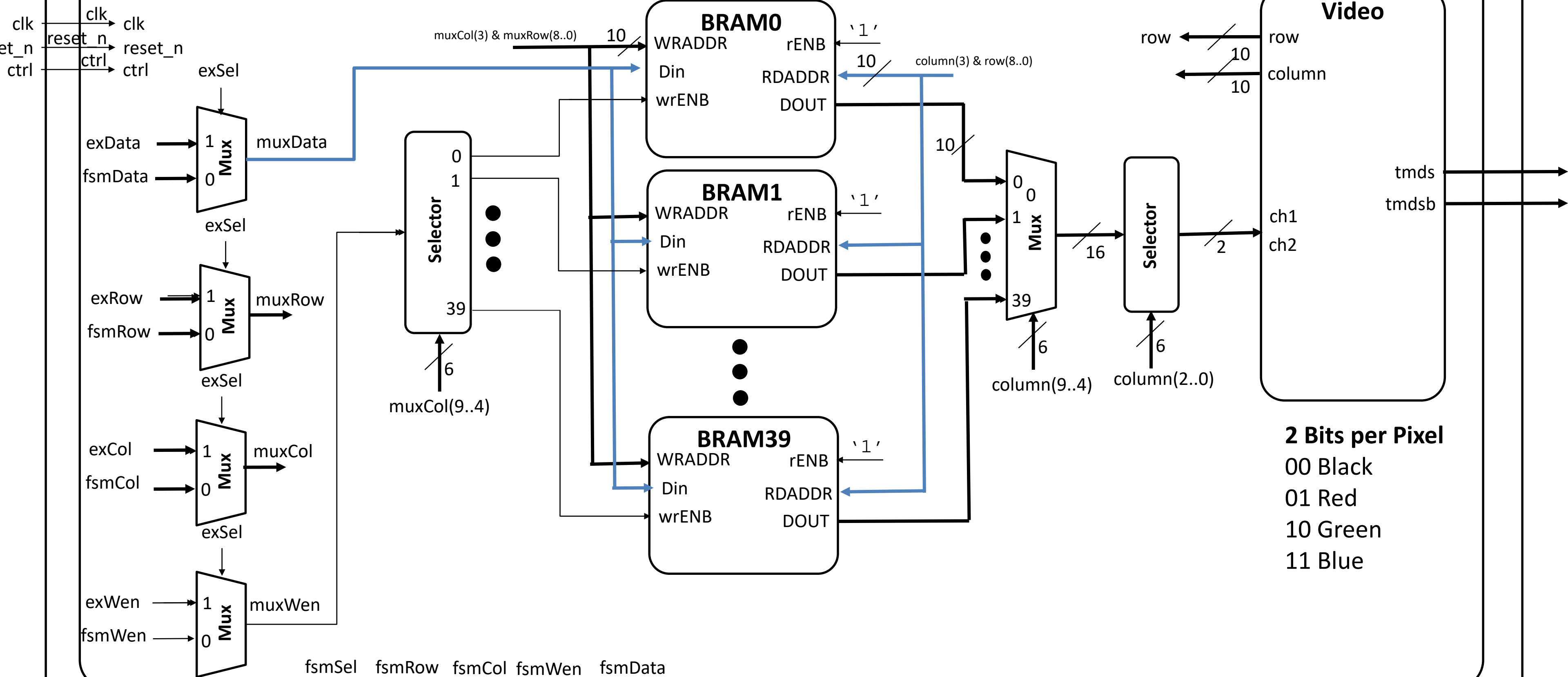
- exWen <= '1', to write

- exWen <= '0' to stop writing

- repeat for the next set of 8 pixels

graphics

graphics_dp



2 Bits per Pixel
00 Black
01 Red
10 Green
11 Blue

graphics_fsm

clk
reset_n

fsmSel fsmRow fsmCol fsmWen fsmData

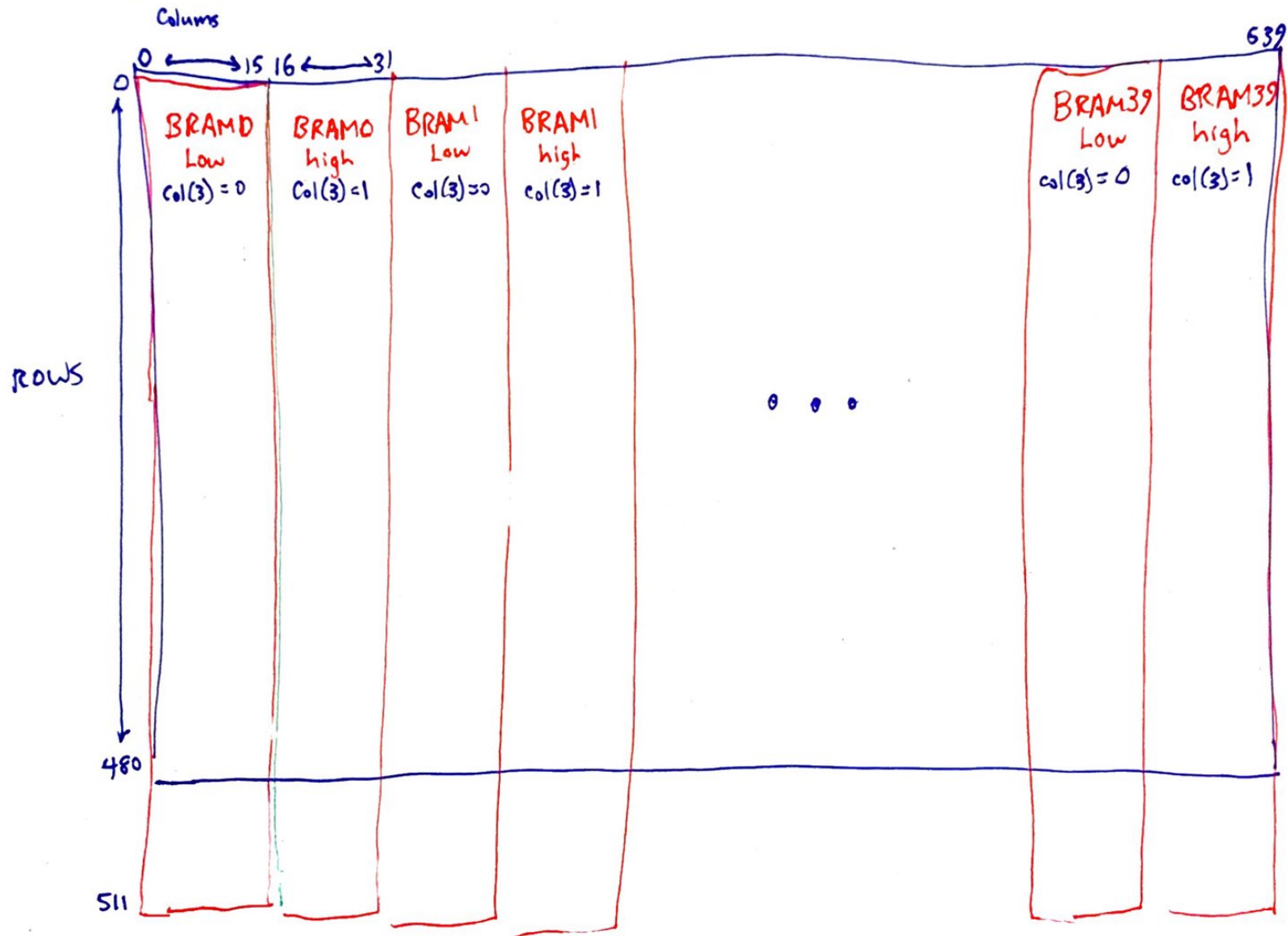
10 10 16

$$1024 \text{ entries} \times 16 \text{ bits} = 16 \text{ kb} < 18 \text{ kb}$$

$$16 \text{ bits} \div 2 \frac{\text{bits}}{\text{pixel}} = 8 \text{ pixels/word}$$

$$640 \text{ columns} / (8 \text{ pixels} \cdot 2) / \text{BRAM} = 40 \text{ BRAMs}$$

640 x 480 image



FSM to test Graphics Memory

