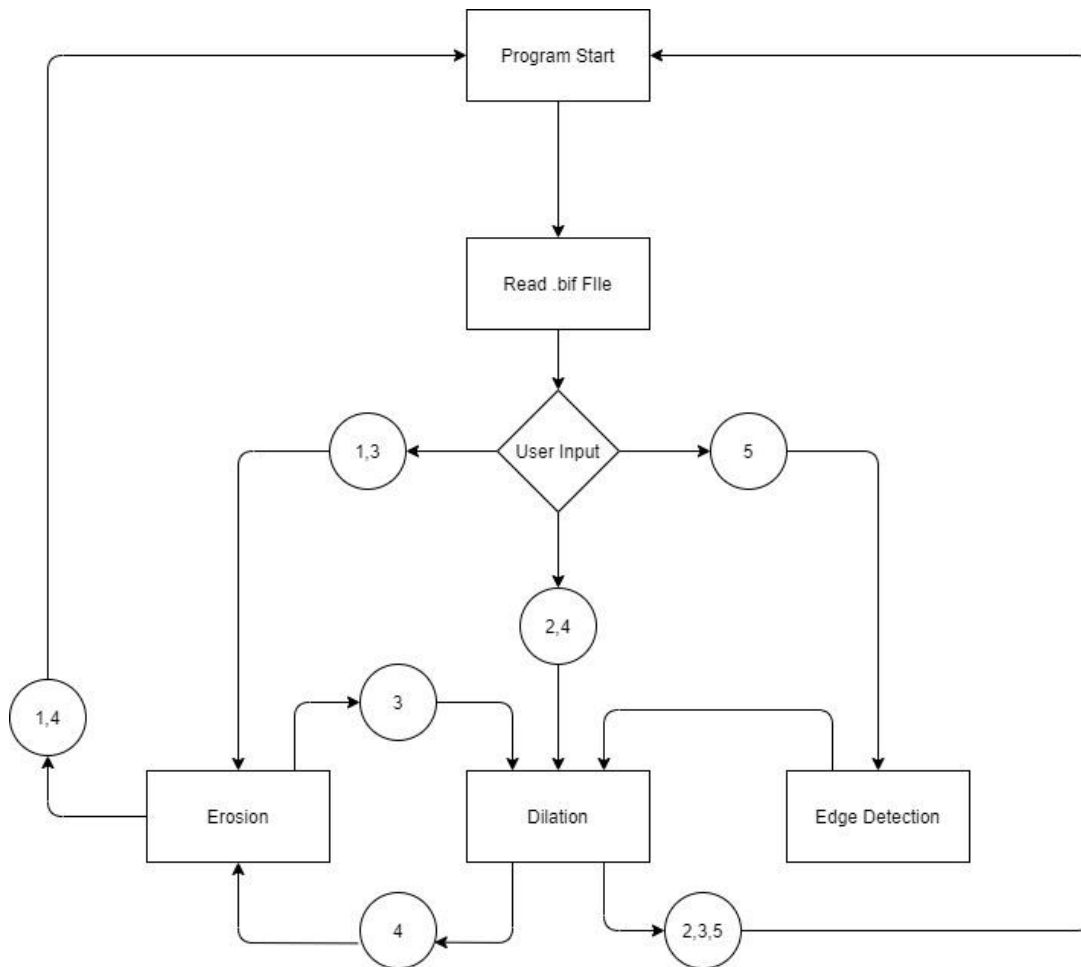




IMAGE MORPHOLOGY

SULLIVAN LAUDERDALE

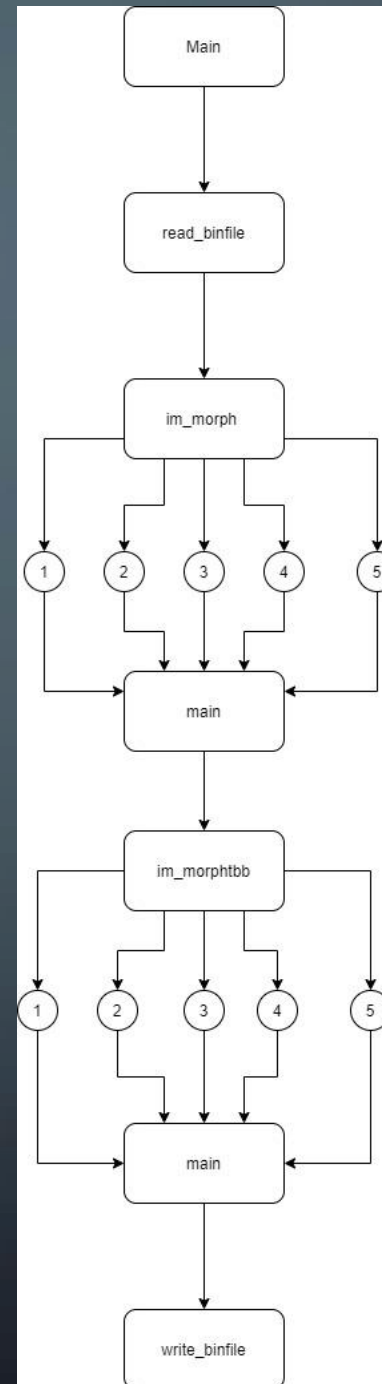


OVERALL STRATEGY

- User input selects operation
- Operations are performed sequentially and using Thread Building Blocks

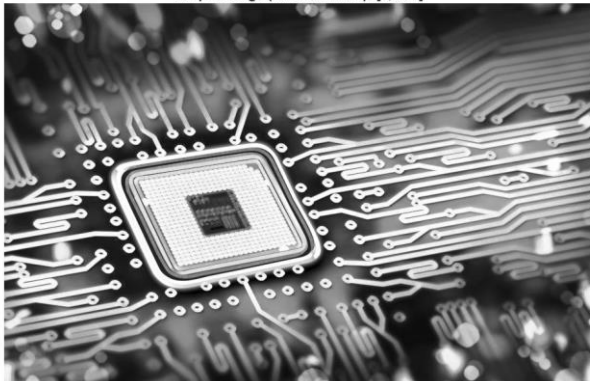
```
./morpho 4 3840 2160
```

FUNCTIONAL FLOW



0	0	1	0	0
0	1	1	1	0
1	1	1	1	1
0	1	1	1	0
0	0	1	0	0

Output image (Terasic board): [0, 255]



DILATION

- Gets maximum value within area
- Performed with a disc
 - Radius 2
- Result generated from board and MATLAB

DILATION TIMING

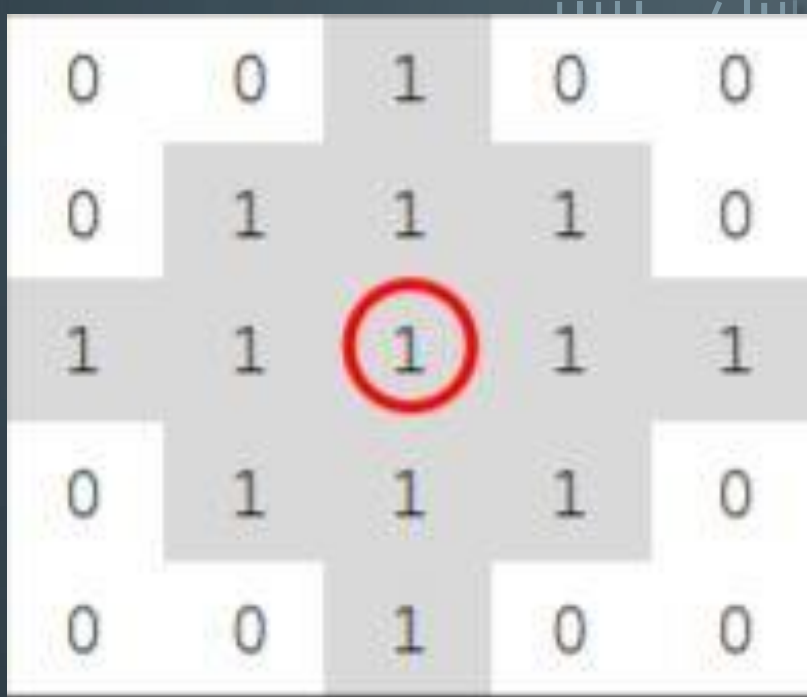
	TBB	SEQ
640X480	65118.2	91901.3
840X486	80998.6	121091.2
940X602	108854.2	165749.9
1080X1080	215625	351569.5
3840X2160	1445532	2370123

Output image (Terasic board): [0, 255]



Output image (Terasic board): [0, 255]

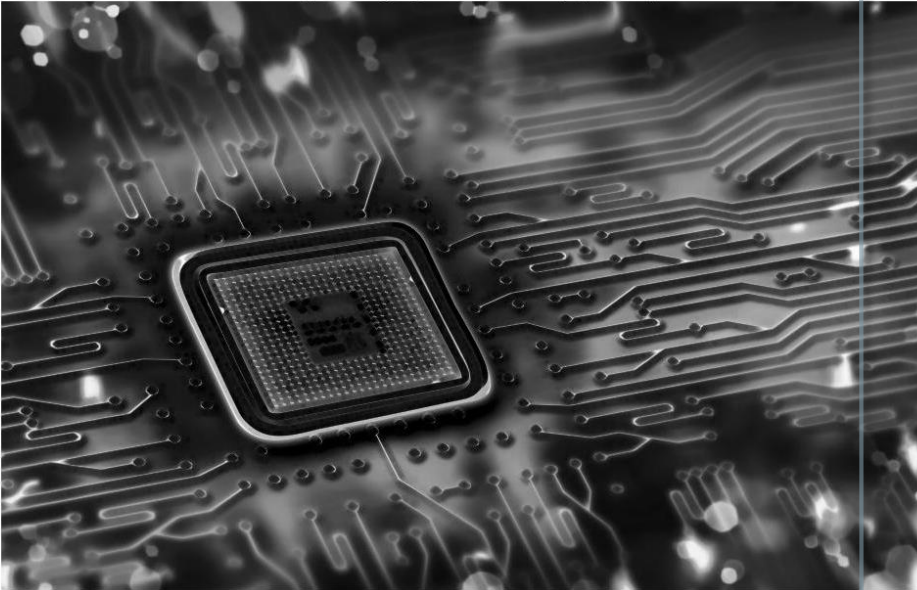




EROSION

- Gets minimum value within area
- Same disc as dilation
- MATLAB vs Terasic board

Output image (Terasic board): [0, 255]



EROSION TIMING

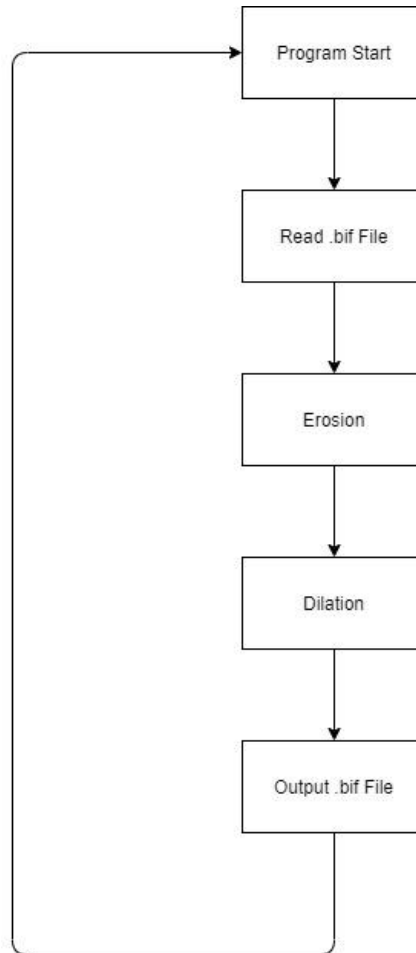
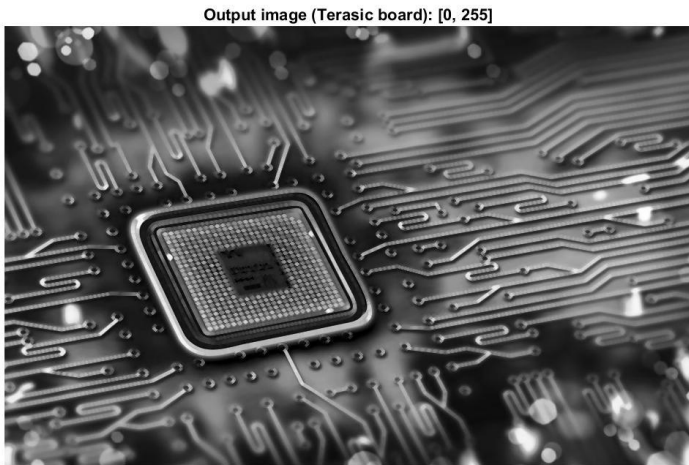
	TBB	SEQ
640X480	62668.7	90263.2
840X486	79711.9	115135.4
940X602	106837.9	161462.8
1080X1080	215925.5	332736.7
3840X2160	1414877	2320940

Output image (Terasic board): [0, 255]



Output image (Terasic board): [0, 255]





OPENING

- Performed sequentially

OPENING TIMING

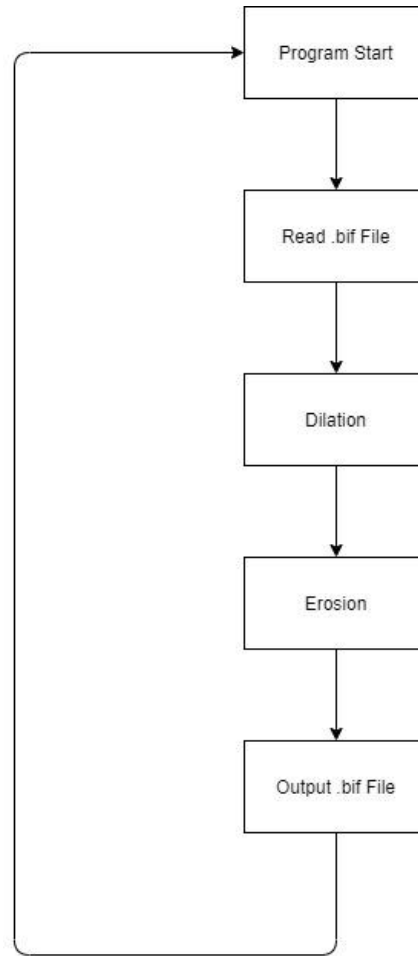
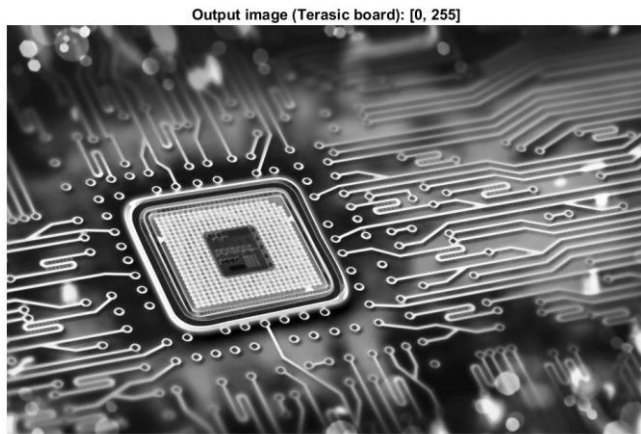
	TBB	SEQ
640X480	128707.5	174647.3
840X486	159361	225240.2
940X602	217368.8	316735.8
1080X1080	447179.8	694088.8
3840X2160	2945601	4702000

Output image (Terasic board): [0, 255]



Output image (Terasic board): [0, 255]





CLOSING

- Performed sequentially

CLOSING TIMING

	TBB	SEQ
640X480	122573.5	170861.3
840X486	166873.1	230879.9
940X602	214482.5	319985.4
1080X1080	431267.7	648047
3840X2160	2864193	4635286

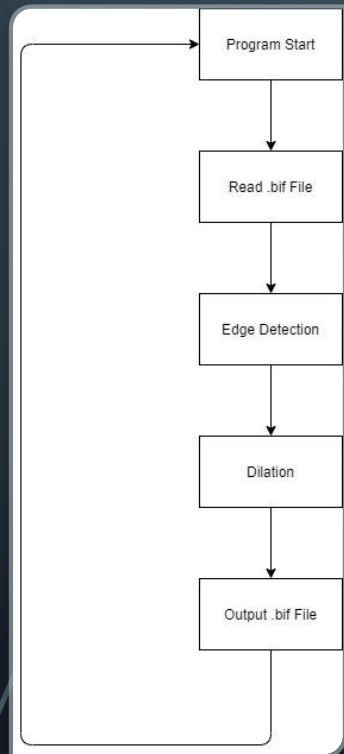
Output image (Terasic board): [0, 255]



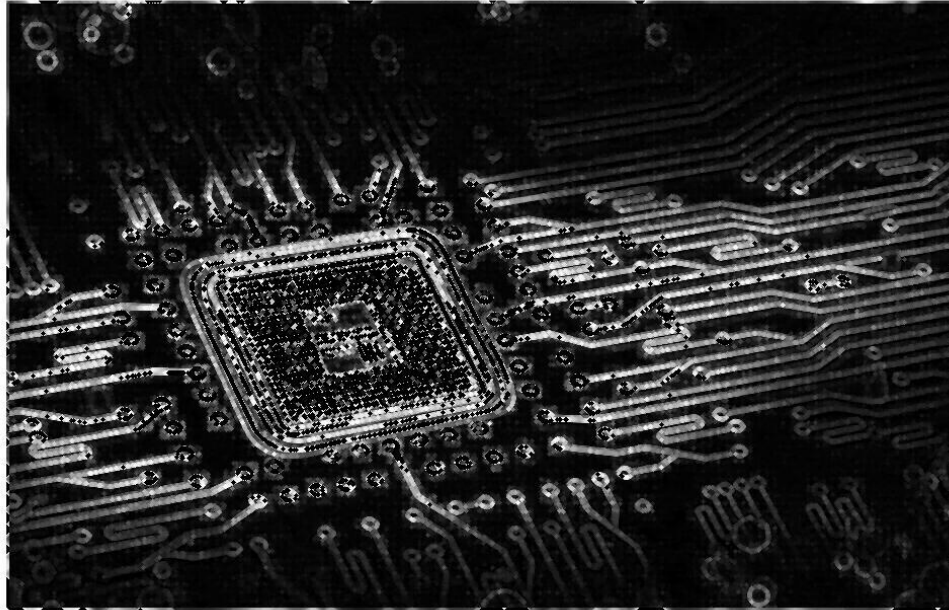
Output image (Terasic board): [0, 255]



BOUNDARY EXTRACTION



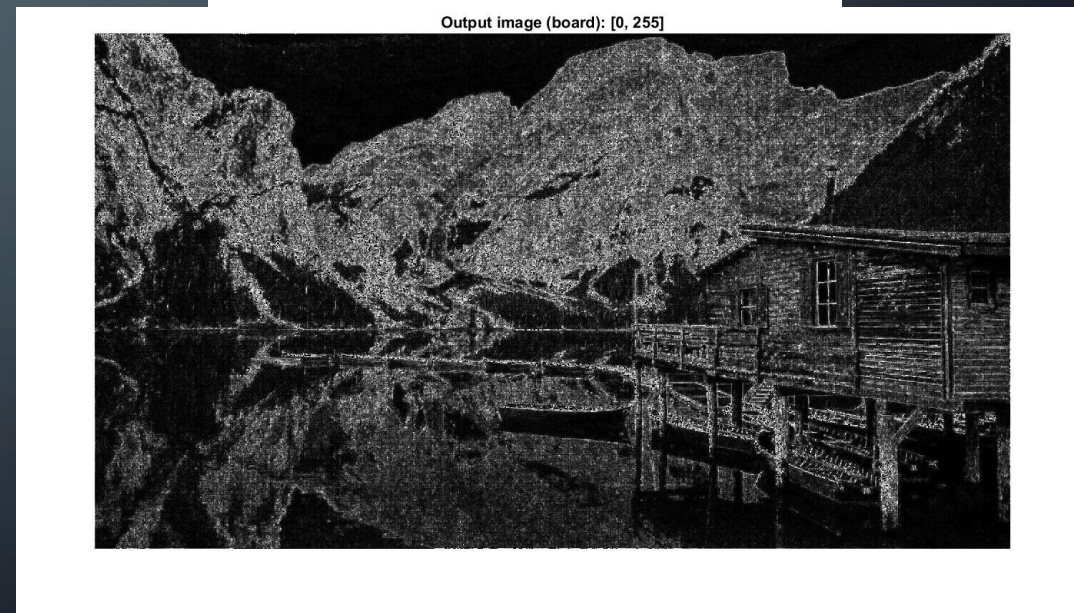
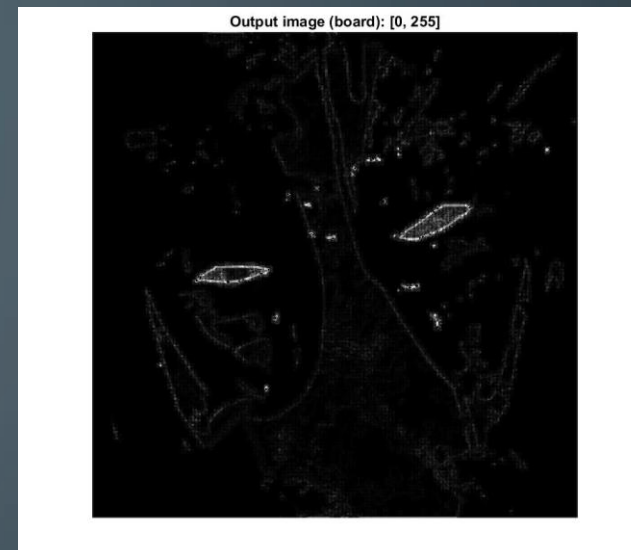
Output image (board): [0, 255]



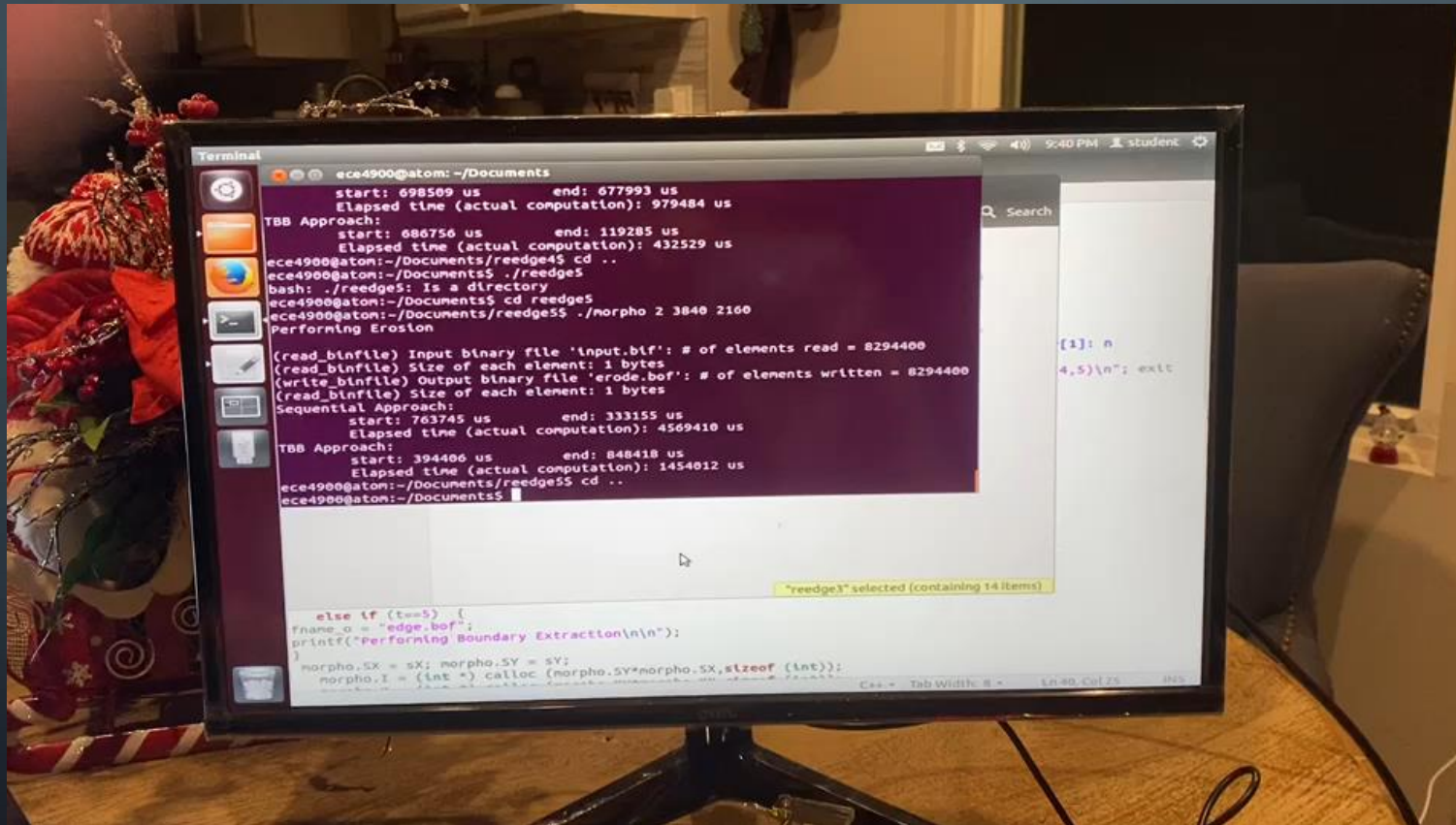
- Convolution followed by dilation

BOUNDARY EXTRACTION TIMING

	TBB	SEQ
640X480	101327.7	137012.7
840X486	128350.3	184715.5
940X602	172444.7	244315.4
1080X1080	346436.1	520706.8
3840X2160	2241965	3557525



DEMO





QUESTIONS?