Homework 3 Chroma Subsampling Report

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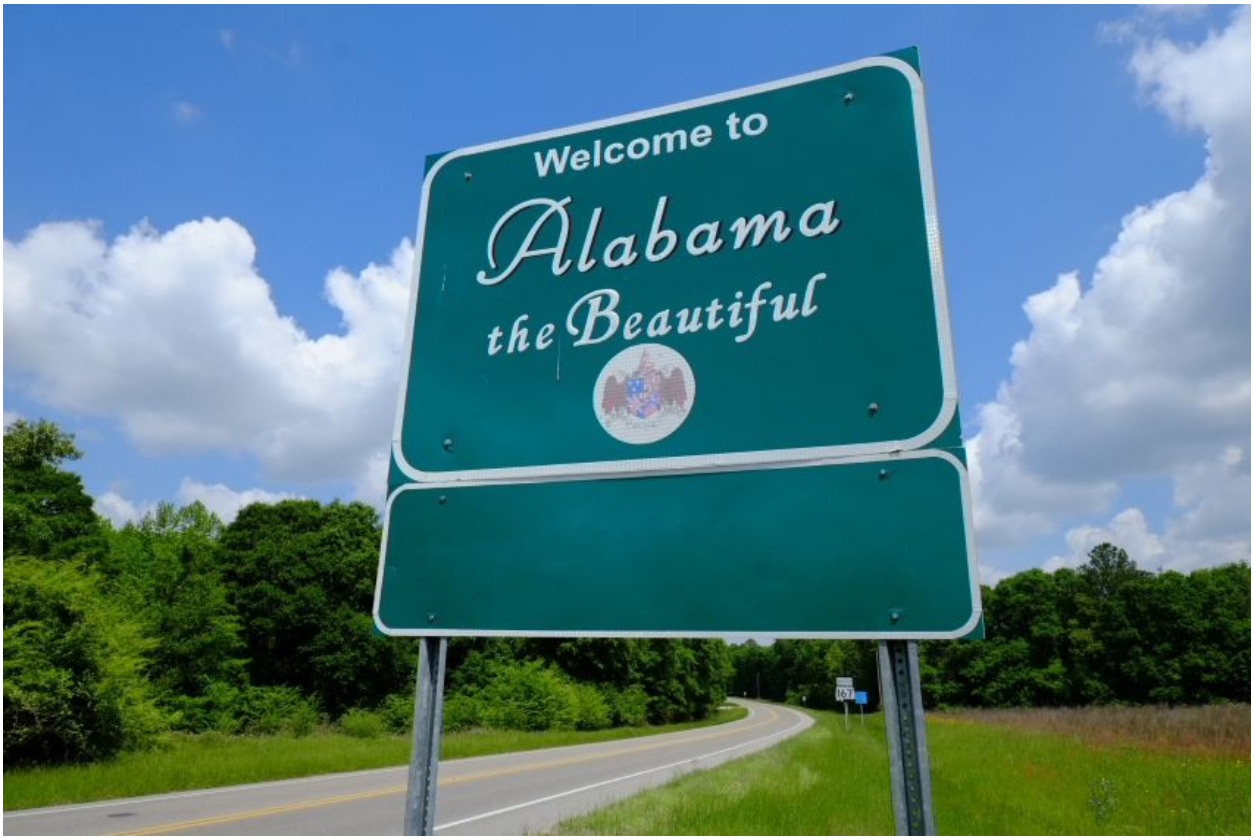
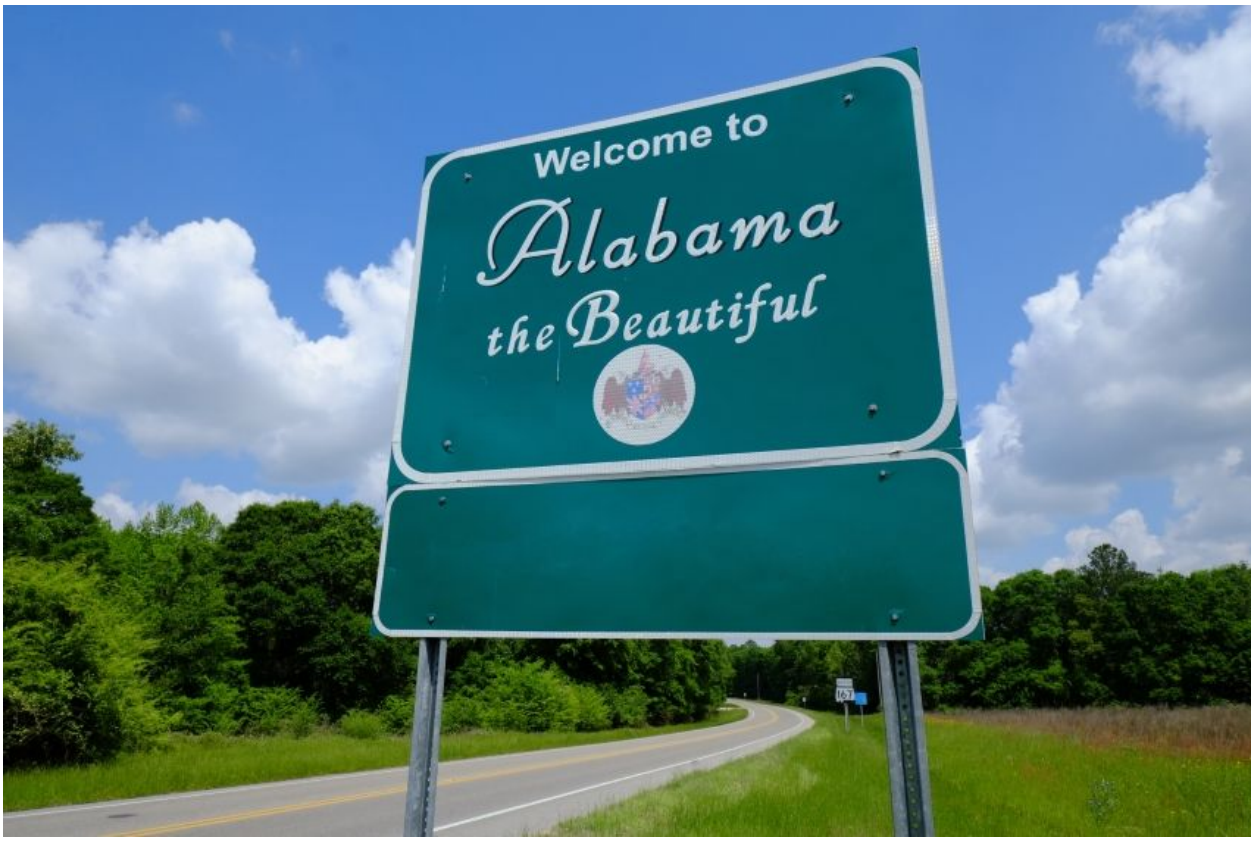
Chroma Subsampling

I implemented chroma subsampling in MATLAB with two types of chroma subsampling, 4:1:1 and 4:2:2.

Image 1

	4:4:4 Input
	4:1:1

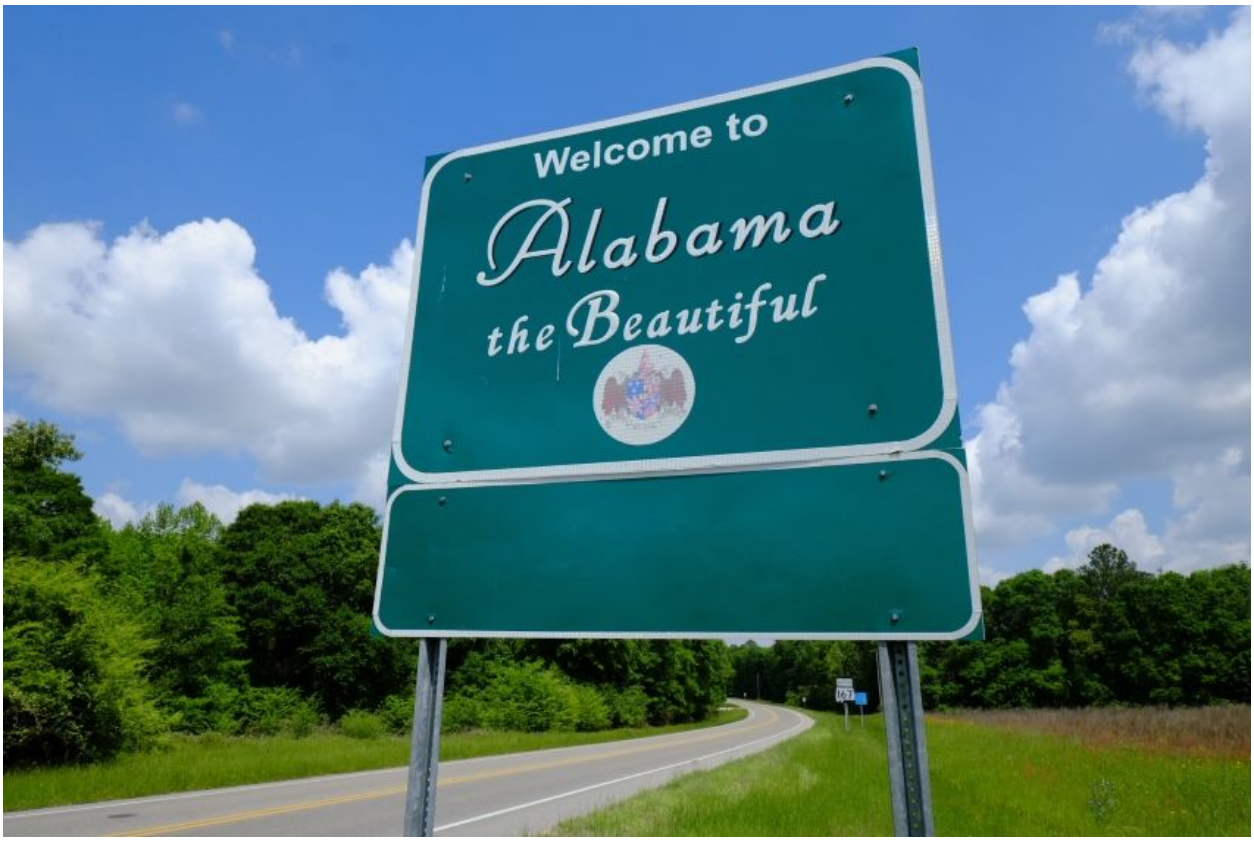
	4:2:2

Image 1 seems to have changed very little from chroma subsampling. Some characters have some blockiness around characters in 4:1:1, but that issue is almost completely resolved in 4:2:2. The grass is a bit less distinguishable in 4:1:1, but it seems fine in 4:2:2. In 4:1:1, the left-hand edges between objects favor the left-most objects, and the right-hand edges favor the right-most objects. For example, note the difference in color around the gray metal poles between the images.


Welcome to
Alabama
the Beautiful

4:1:1 Cb

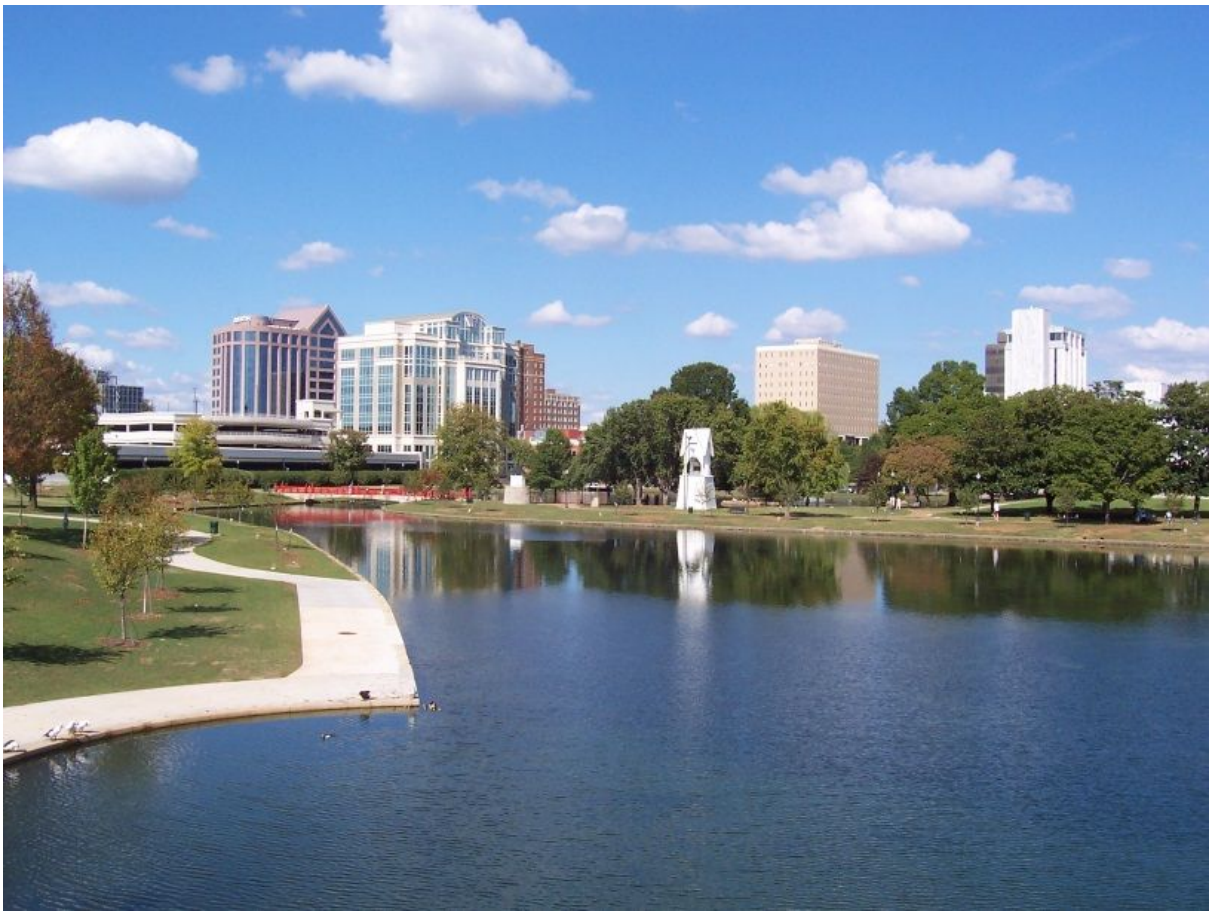
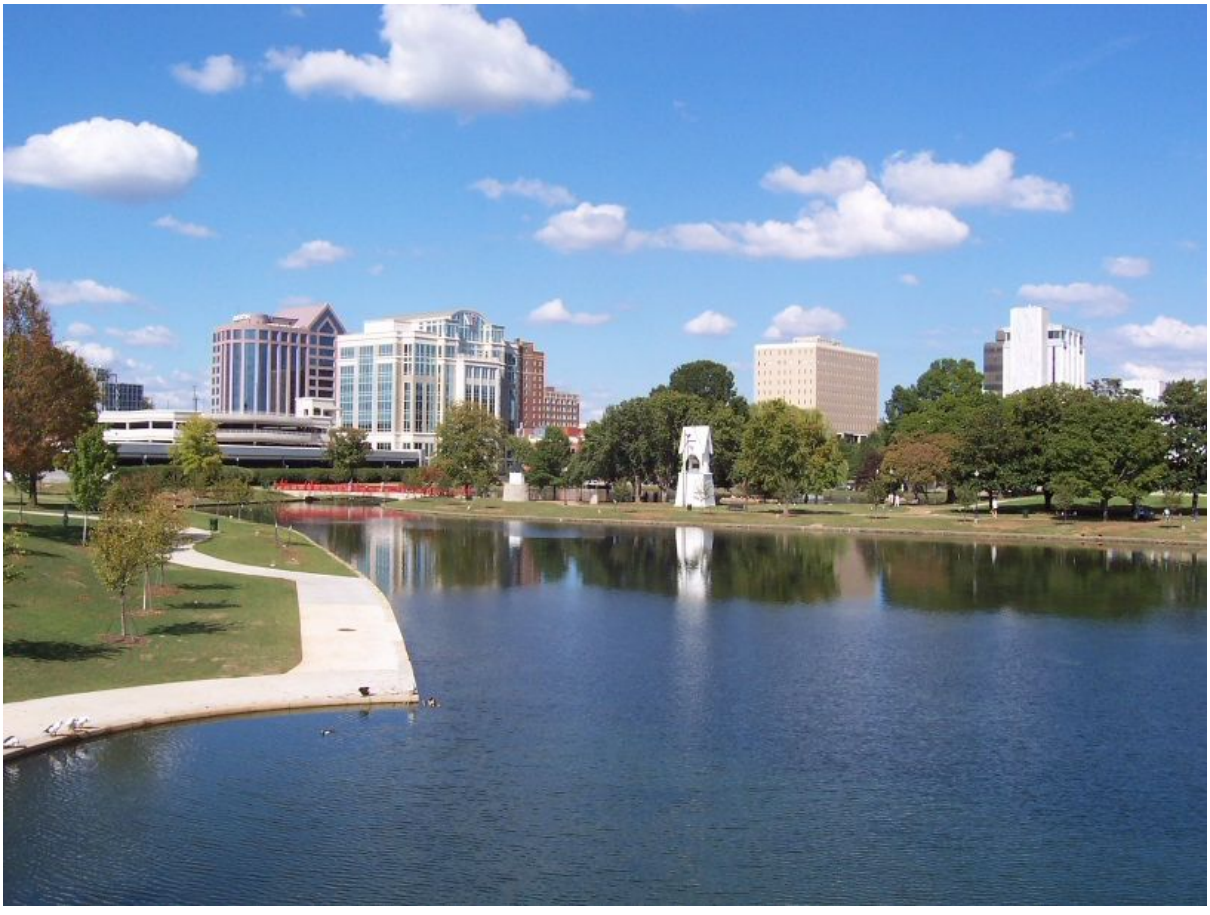

Welcome to
Alabama
the Beautiful

4:2:2 Cb

	4:1:1 Cr
	4:2:2 Cr

The gray images reveal a clear reduction in image quality in 4:1:1. The text and borders look very blocky and messy. In 4:2:2, however, the difference is quite hard to tell without zooming in.

Image 2

	4:4:4 Input
	4:1:1

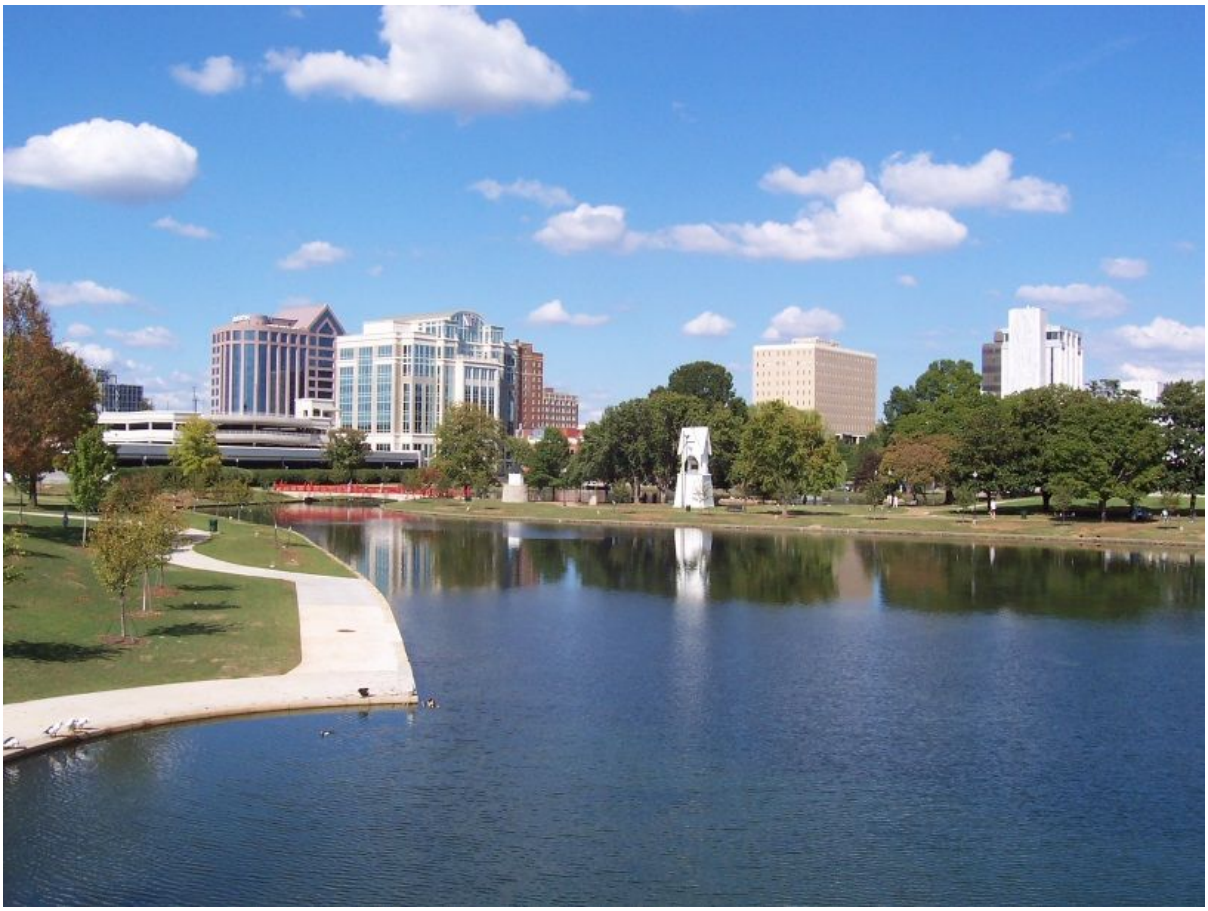
	4:2:2

Image 2 seems not to have changed from a distance. It holds up well to chroma subsampling. However, if you zoom in on 4:1:1, especially on the buildings, there appear many strange colors in blocks as if the building were cyan and purple. This effect is significantly reduced in 4:2:2 because the chunks of strange color are much smaller. The water still looks good, and the colors still look accurate.

	4:1:1 Cb
	4:2:2 Cb

	4:1:1 Cr
	4:2:2 Cr

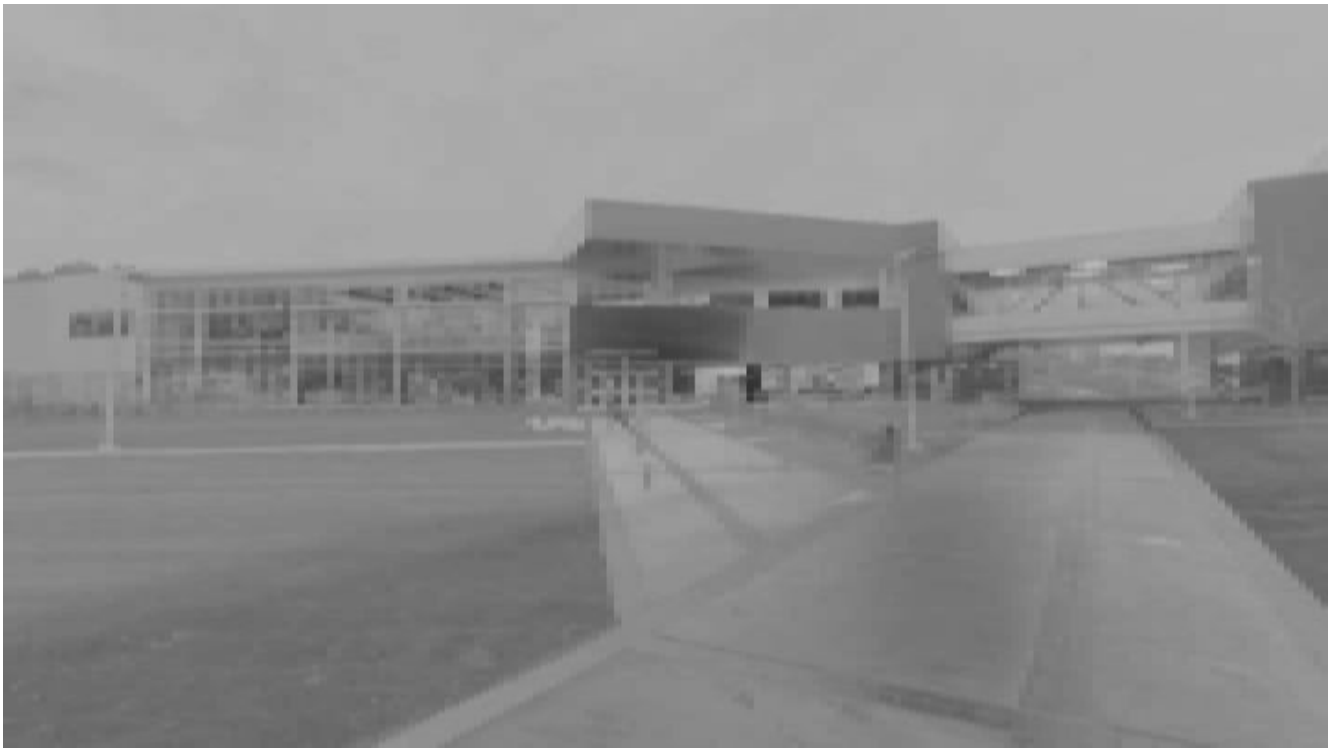
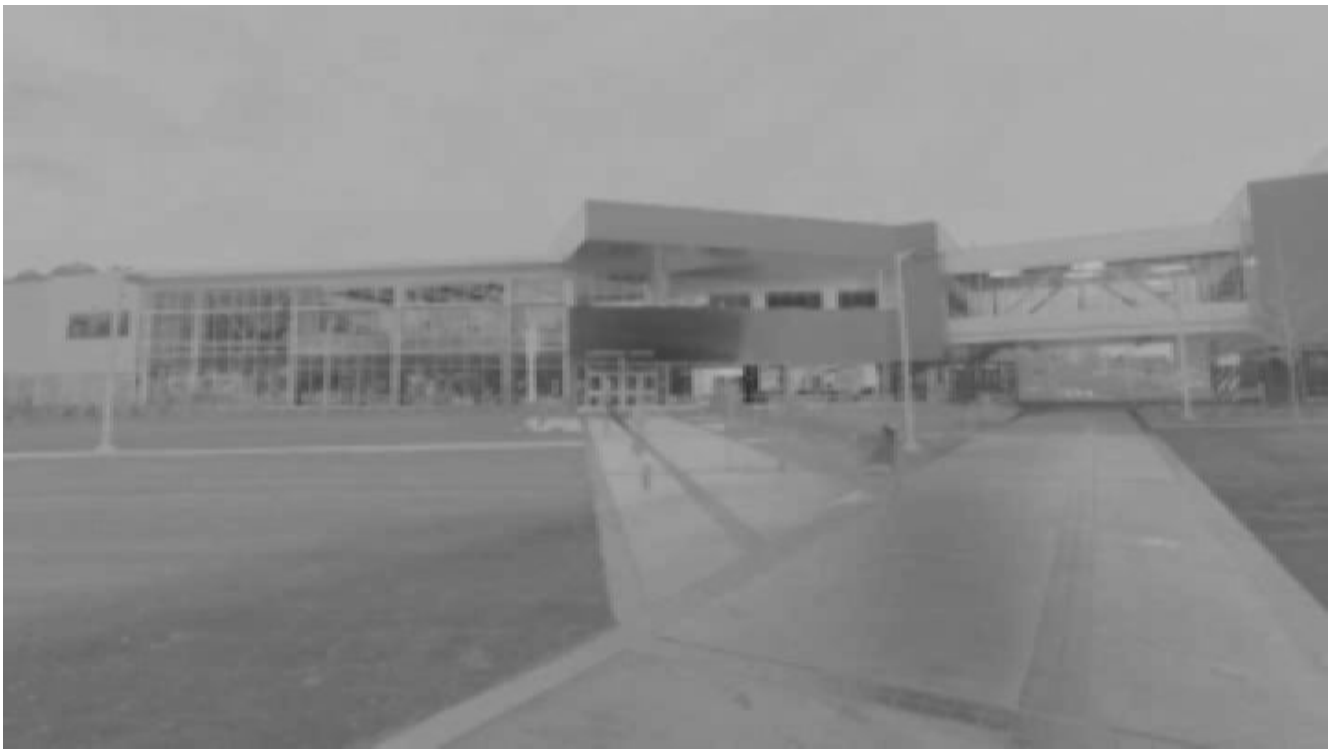
Again, the gray images reveal a clear reduction in image quality in 4:1:1, and even somewhat in 4:2:2. The windows on the buildings look very torn up and overlapping. In 4:2:2, however, the difference is somewhat hard to tell without zooming in. The bridge's reflection on the water looks a bit strange in 4:1:1. Clouds are blocky in 4:1:1.

Image 3

	4:4:4 Input
	4:1:1

	4:2:2

Image 3 seems to have changed quite a bit due to chroma subsampling. The many diagonal lines such as window trusses and sidewalks fall apart in 4:1:1, but the effect is lessened in 4:2:2. The lines look very blocky instead of smooth. The colors on the brown areas of the building look very segmented instead of smooth. There is a strangely large region of gray next to the center street light without reason in 4:1:1.

	4:1:1 Cb
	4:2:2 Cb

	4:1:1 Cr
	4:2:2 Cr

Again, the gray images reveal a significant reduction in image quality in 4:1:1 and a minor reduction in 4:2:2. It is especially easy to see artifacts on top of the building in 4:1:1. The walkways look very jagged and incorrect in 4:1:1, but they hold up fairly well in 4:2:2. The interior of the building is very blocky and indistinguishable, especially in 4:1:1. The clouds look fairly strange in both images.