Scientific Visualization I

Assignment 6

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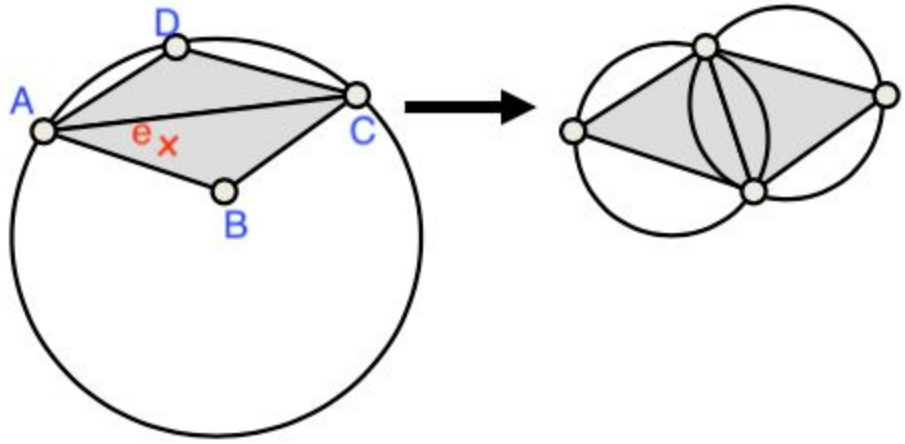
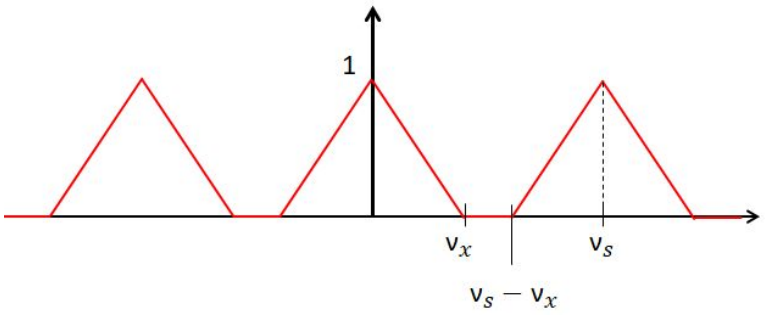
Exercise 6.1

The problem with color interpolation on triangle grids is that interpolation could be inaccurate if the triangulation of the triangle grid is not “good” enough. By defining a good triangulation, we can refer to Delaunay Triangulation, which avoids long and sharp triangles. From the following graph from chapter-4 slides. Left-hand side is not Delaunay triangulation but right hand is. In the case of a geographical elevation map with scalar field of each point being elevation level, where f(A) and f(C) are very high but f(B) and f(D) are low. We can see directed interpolate point e with ABC on left-hand triangle would result in inaccurate elevation level. Meanwhile, interpolate point e with ABC on Delaunay triangle makes much more sense.

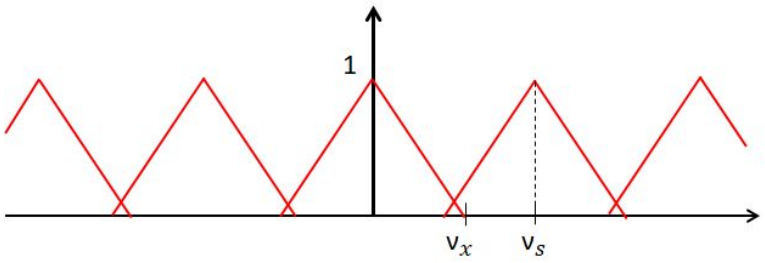


Exercise 6.2 Signal Processing

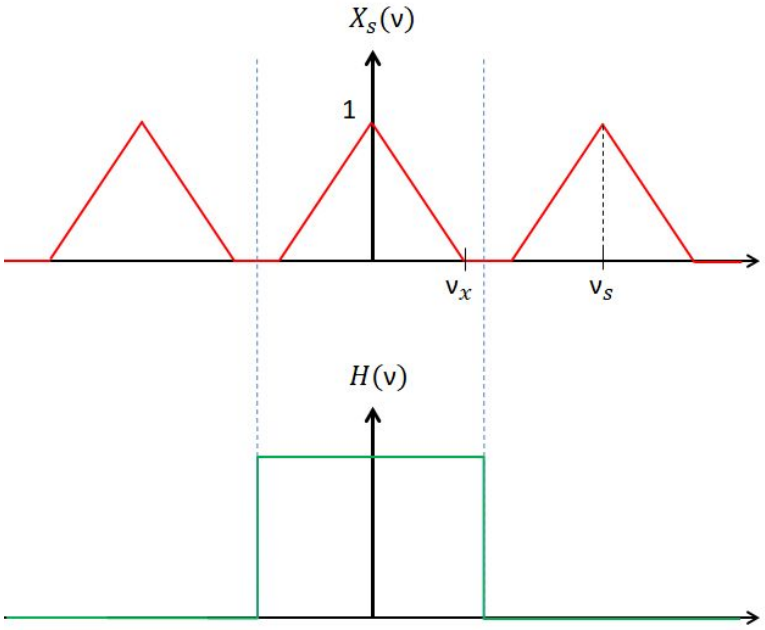
1. If we want to correctly reconstruction $X()$, then $_s \geq 2\ _x$.
2. Case 1: $_s \geq 2\ _x$



Case 2: $_s < 2\ _x$



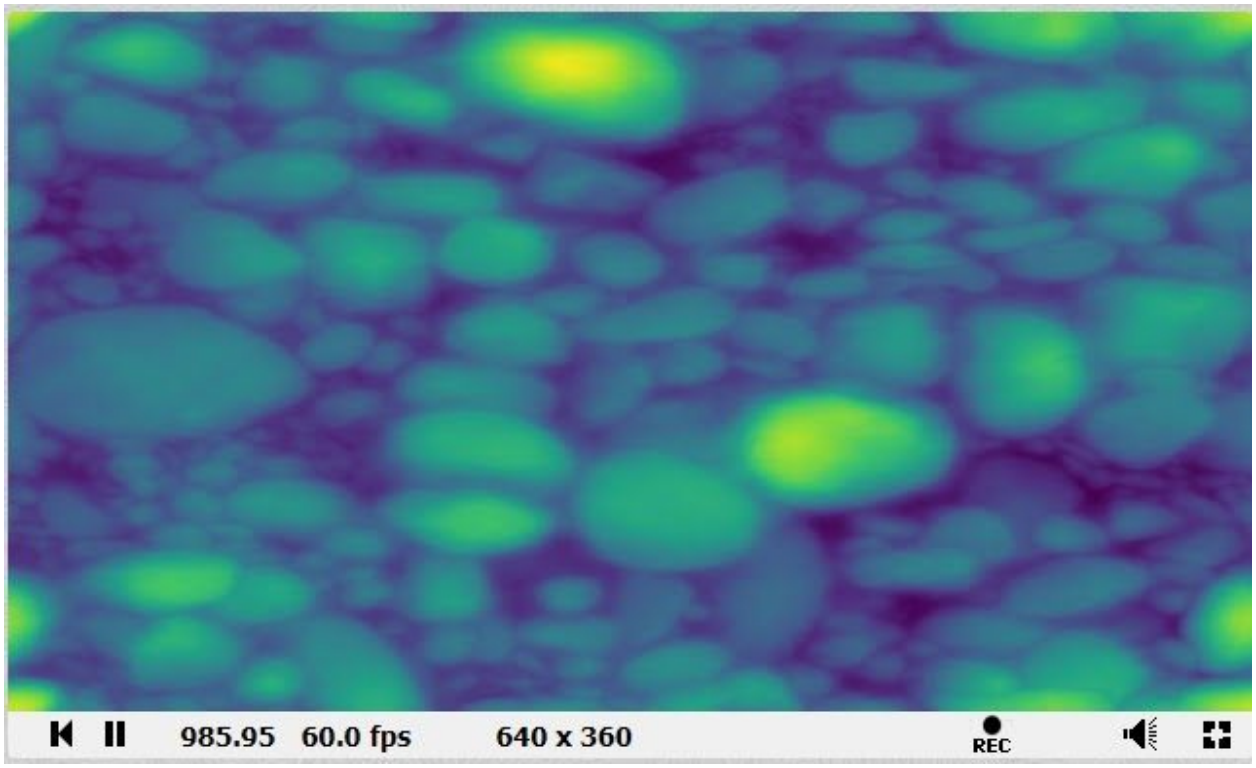
3. To reconstruct the original signal, we use the sinc function as a filter. Assuming that $H()$ is the sinc function in frequency domain, and $X_S()$ is the sampled signal in frequency domain. Then we can reconstruct the signal $X() = H() \cdot X_S()$.



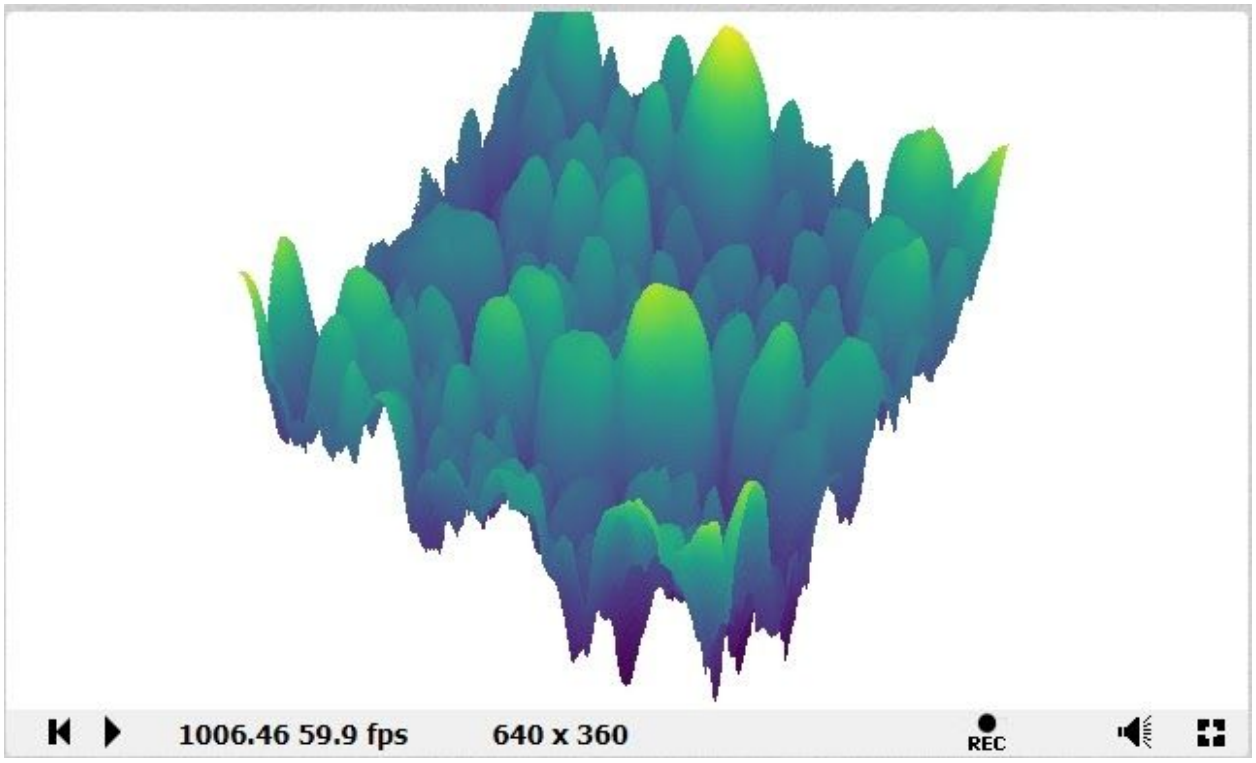
Exercise 6.3

Source code can be found in:
https://github.com/kuangyu0801/ScientificVisulization_SS20/tree/master/Assignment06

Task 1



Task 3


1006.46 59.9 fps
640 x 360
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