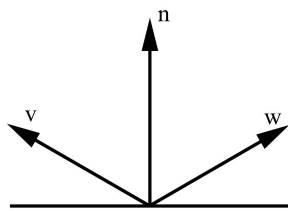# CS 4620 Written Assignment 4: Textures

out: Wednesday 14th October 2015

due: Thursday 29 October 2015 (11:59pm)
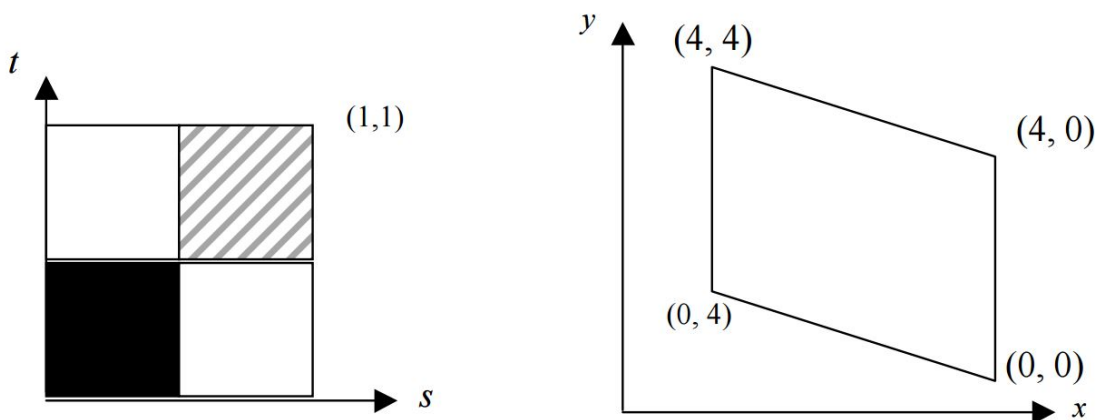
This written part should be done alone, not in pairs.
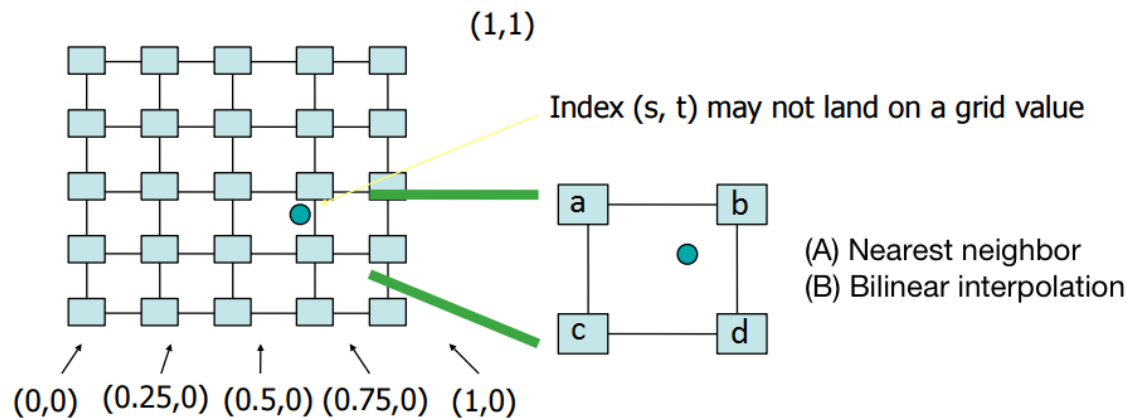
1   Mirror Reflection

In this question, we aim to compute the mirror reflection direction at a point. Given a view direction v and normal direction n, how to compute the reflected direction w using the given quantities?

2   Texture Mapping

Sketch the result of texture mapping the image shown on the left to the quadrilateral shown on the right, with texture coordinates as shown next to the quadrilaterals vertices. Assume that texture coordinates wrap if they exceed 1.

3   Texture Filtering

When we look up the texture value in a 2D image, there is one issue we need to think about: The 3D world space is continuous, so that the transformed and normalized 2D image space are also continuous. However, the texture image is a discrete 2D array.

This can be shown from the figure 4 above. Consider a simple texture image with $5 \times 5 = 25$ pixels. Their 2D coordinates are discrete as $\{(0,0), (0.25,0), ..., (1,0), (1,0.25), ..., (1,1)\}$. The index $(s,t) = (0.7,0.4)$ is our transformed 2D coordinate which doesn't match any pixel in the texture image. So texture filtering comes out.

Given the nearest 4 texture values $\{a,b,c,d\}$ around the index (s,t), show the filtered texture value using:

(A) Nearest neighbor

(B) Bilinear interpolation