Project #3 Displacement Mapping, Bump Mapping, and Lighting

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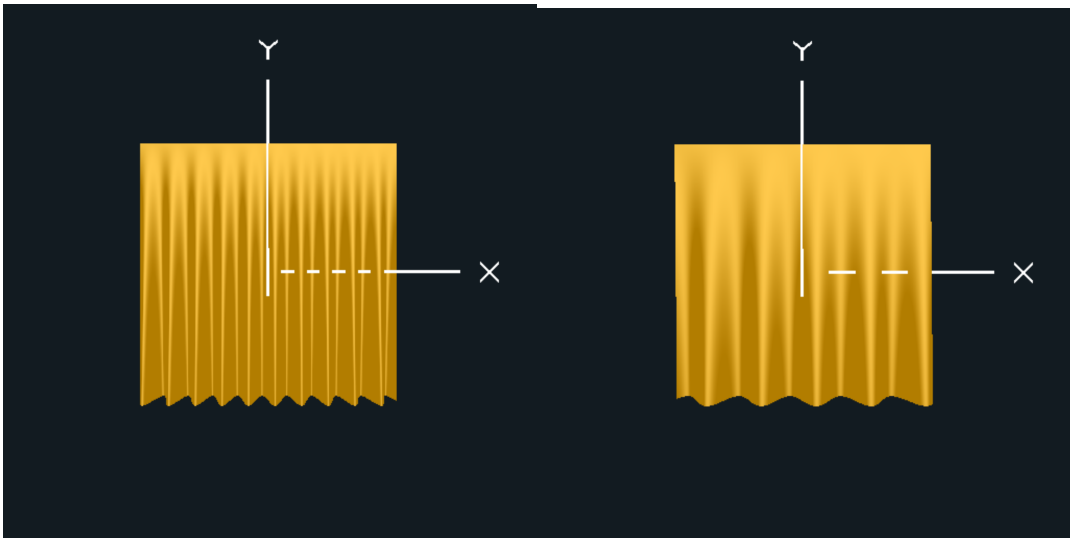
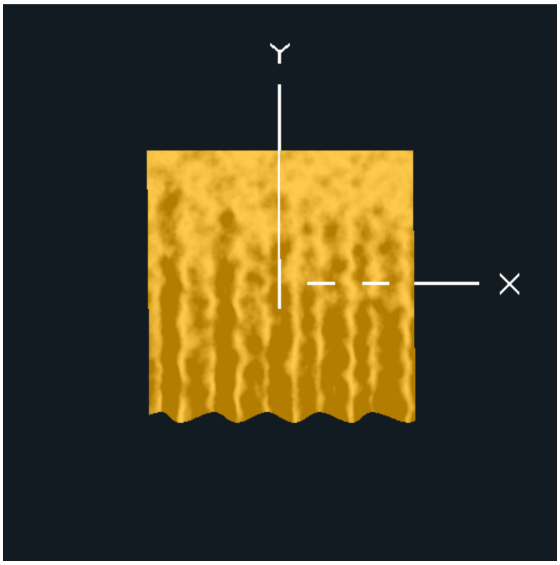
Link: https://media.oregonstate.edu/media/t/1_d0u3enpw

1.Correctly show the effect of changing uK and uP

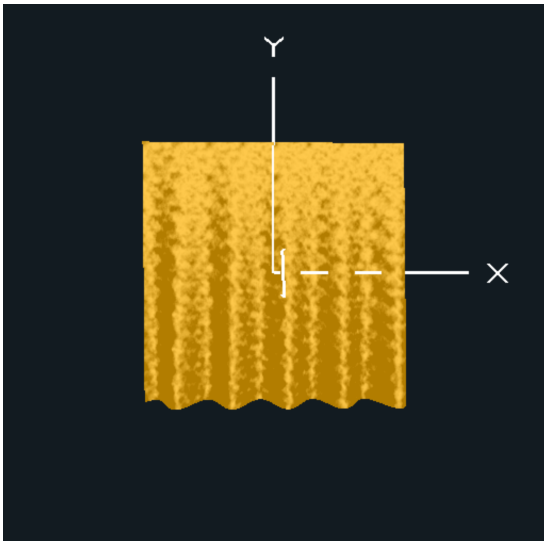


The left pic is a square with a uK value, increasing the amplitude of the sin wave (pleats). The right image is the square with a low uP (Period), resulting in many pleats. According to the lecture notes, the pleats are a sine wave that moves in the X direction. The top of the curtain is fixed on a rod, so the pleating is zero there, and increases as you go down in -Y. If (x,y,z) are the vertex coordinates being processed right now, the formula is :
z = K * (Y0-y) * sin(2.*PI*x/P).

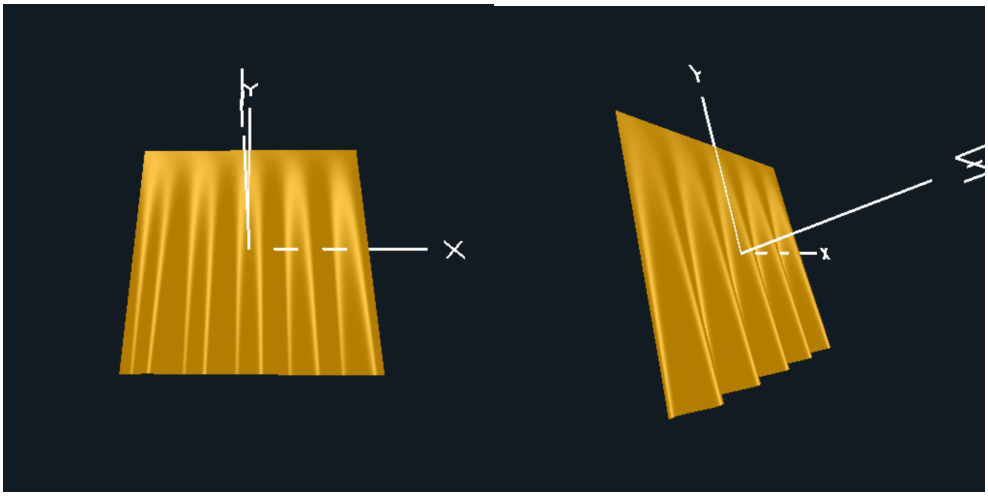
2.Correctly show the effects of changing uNoiseAmp



3.Correctly show the effect of changing uNoiseFreq



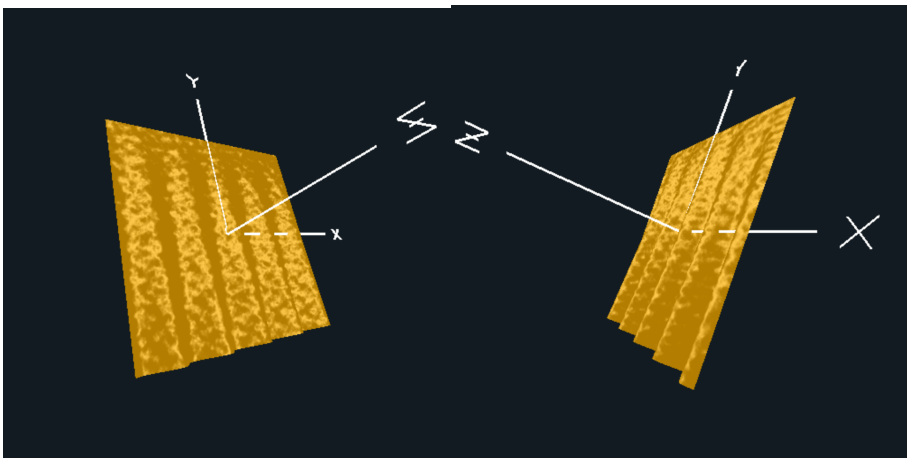
4.Use lighting to show that you have computed the normal correctly



According to the project notes, the cross product of two vectors gives the third vector that is perpendicular to both. Hence, those 2 vectors lie in the plane of the surface, they are tangent vectors. The relative formula is following below:
float dzdx = K * (Y0-y) * (2.*PI/P) * cos(2.*PI*x/P)
float dzdy = -K * sin(2.*PI*x/P)

Tangent vectors:
Tx = (1., 0., dzdx)
Ty = (0., 1., dzdy)

5.Use lighting to show that you have computed the bump-mapping correctly



According to the project notes, the crinkle is bump mapping. I add a noisy and use the rotate function perturbing the normal. So, it creates shadows and highlights, which makes the surface face different light directions.