CSC418 Computer Graphics

- **Aliasing**
- **Texture mapping**

Aliasing

The physical world is continuous…

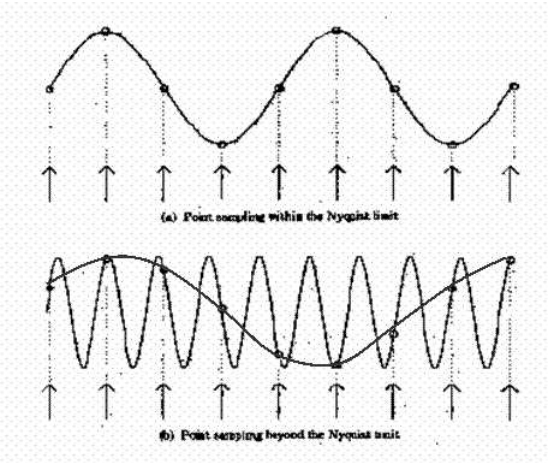
Computer representations of the physical world are often a discrete sampling of the continuous…

"A pixel is a discrete sample of a continuous image"

The question is :

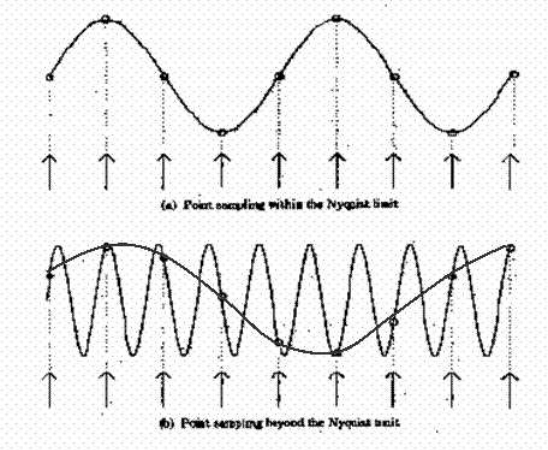
How densely do we need to sample something continuous to capture its essence accurately?

Aliasing

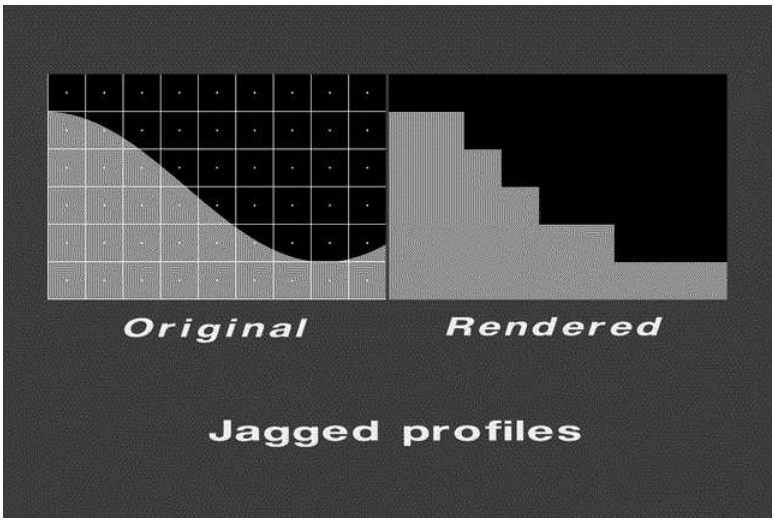


Aliasing

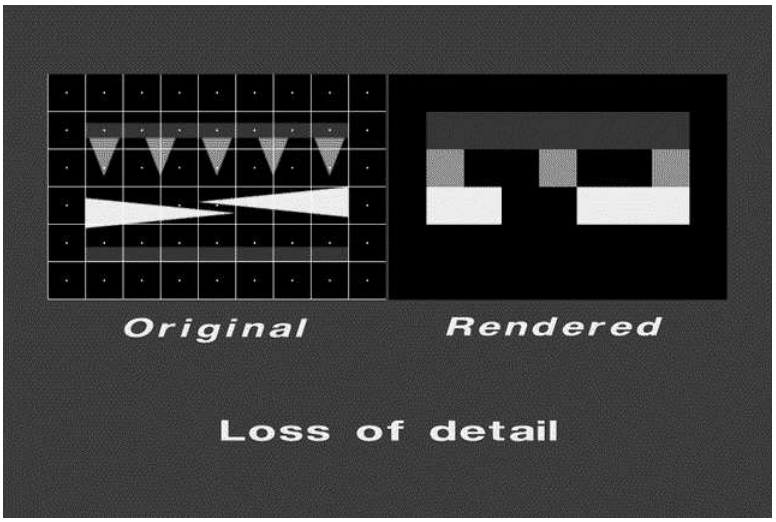
Nyquist Theorem: Acontinuous signal can be completely recovered from its samples iff the sampling rate is greater than twice the maximum frequency present in the signal.



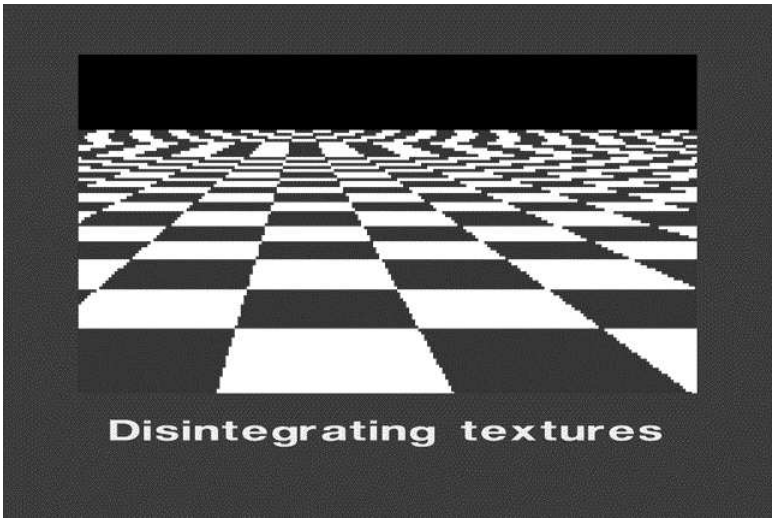
Aliasing(examples)



Aliasing(examples)



Aliasing(examples)



Aliasing

In order to have any hope of accurately reconstructing a function from a periodically sampled version of it, two conditions must be satisfied:

- **The function must be bandlimited.**
- **The sampling frequency must be at least twice the maximum frequency of the function.**

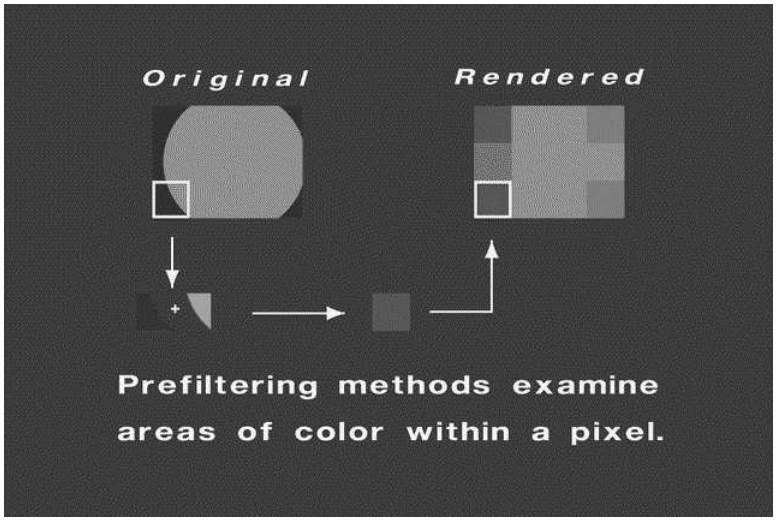
Satisfying these conditions will eliminate aliasing.

Antialiasing

- **Prefiltering.**
- **Postfiltering (supersampling).**

Antialiasing(prefiltering)

What is prefiltering?



Antialiasing(prefiltering)

Prefiltering example

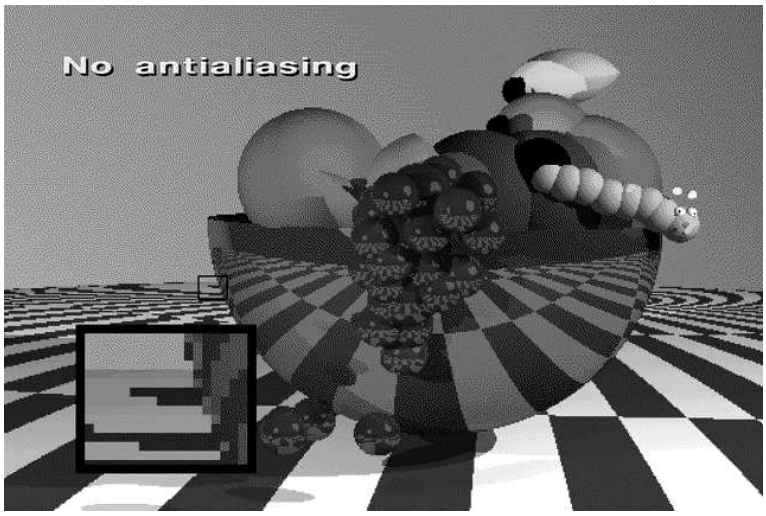
Antialiasing(postfiltering)

What is postfiltering?

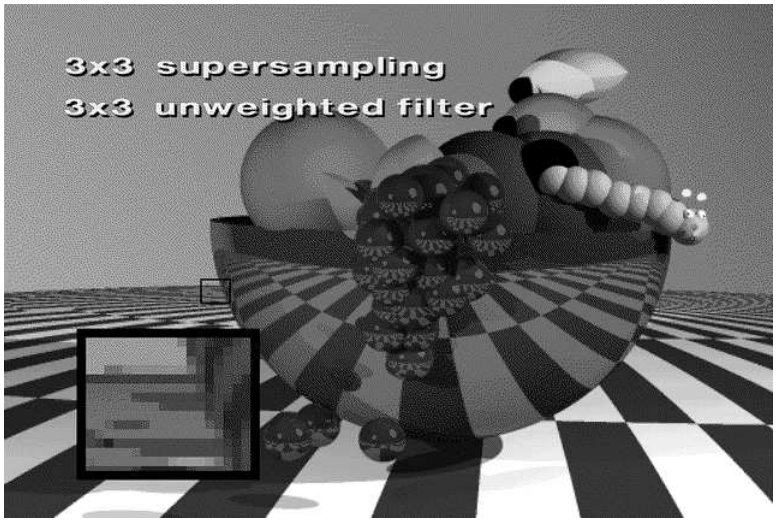
Given a sample frequency prefiltering computes a lower frequency signal from the continuous representation.

Postfiltering first supersamples the signal in its unfiltered form and then filters out the high frequency from the supersamples.

Antialiasing(postfiltering)



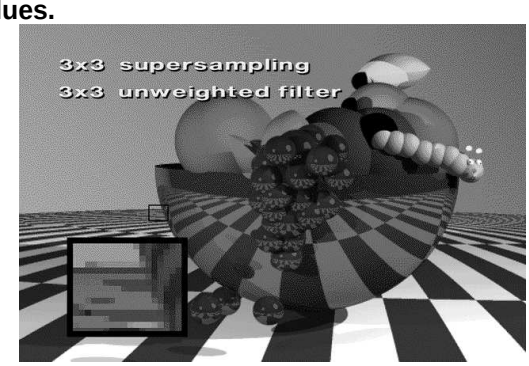
Antialiasing(postfiltering)



Antialiasing(postfiltering)

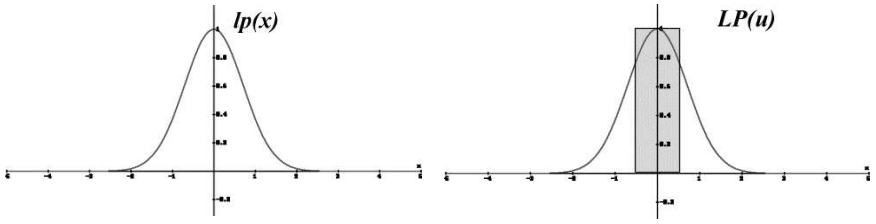
How should one combine samples?

Simply add?
Weight average is better!
Filter shape = weight values.

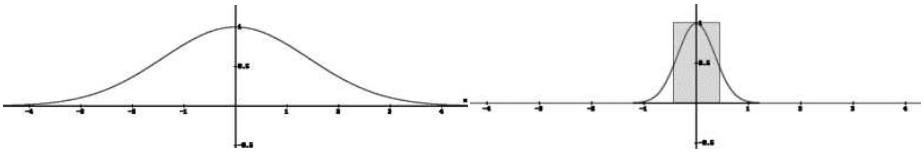


Antialiasing(postfiltering)

Filter shapes **Gaussian**



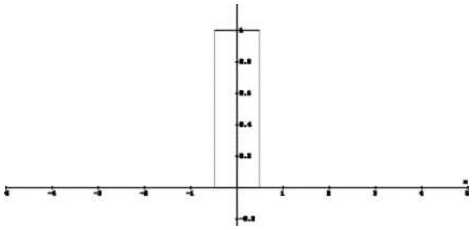
Wide Gaussian



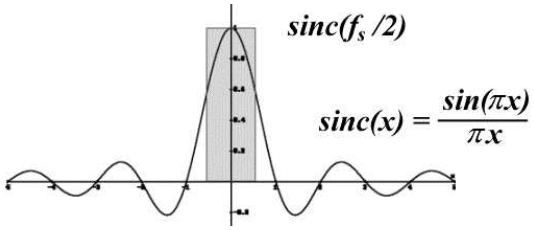
Antialiasing(postfiltering)

Is there an ideal filter shape?

Box

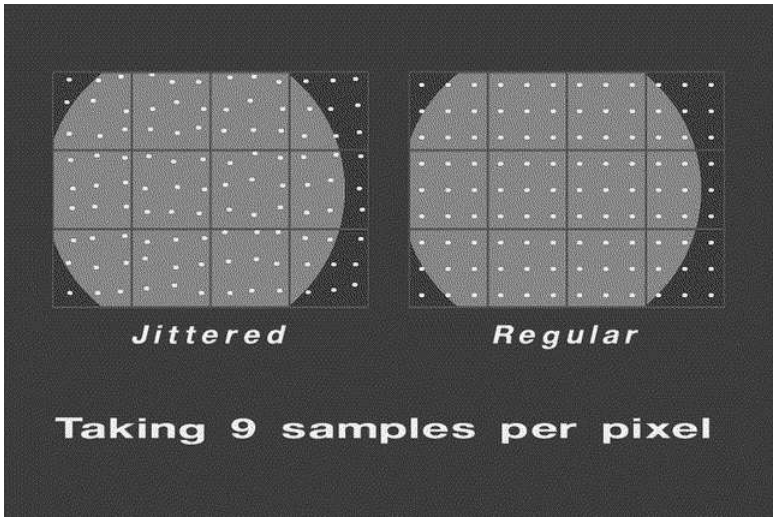


Sinc



Antialiasing(postfiltering)

How should one supersample?

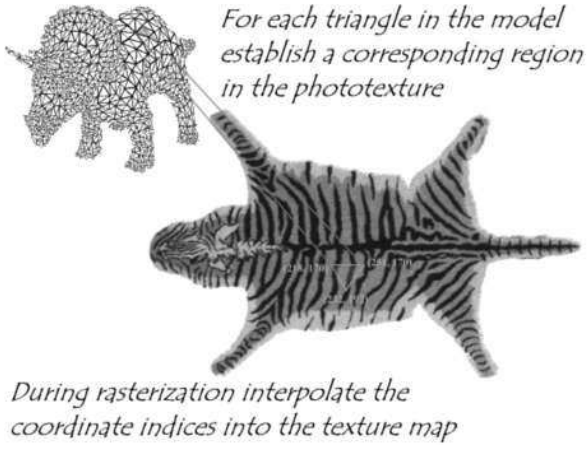


Texture mapping

Photographic Textures

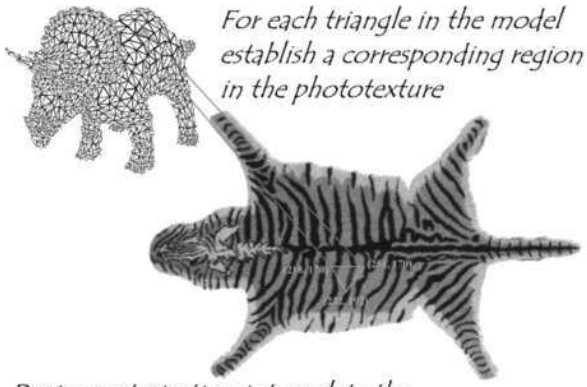
Texture mapping

Photographic Textures



Texture mapping

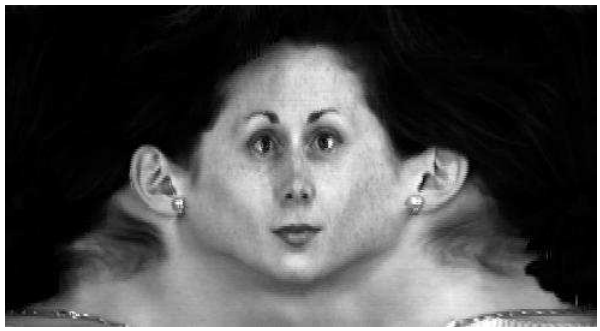
How does one establish correspondence? (UV mapping)



During rasterization interpolate the coordinate indices into the texture map

Texture mapping

Projective Textures

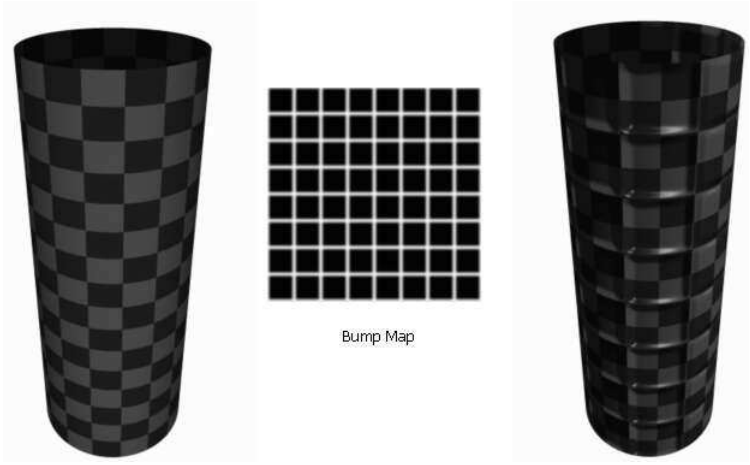


Texture mapping

- **Textures**

Texture mapping

- **Bump mapping**



Texture mapping

- e lection mapping

Next Lecture

Putting it all bac together