ANTI-ALIASING

What Does Aliasing Means?

In computer graphics, the process by which smooth curves and other lines become jagged because the resolution of the graphics device or file is not high enough to represent a smooth curve. Smoothing and antialiasing techniques can reduce the effect of aliasing.

Anti-Aliasing

Anti-aliasing is a technique used in digital imaging to reduce the visual defects that occur when high-resolution images are presented in a lower resolution output devices like the monitor or printer. Aliasing manifests itself as jagged or stair-stepped lines (Also known as jaggiest) on edges and objects that should otherwise be smooth. With sound, aliases are removed by eliminating frequencies above half the sampling frequencies.

Before and After of Anti-Aliasing

Anti-aliased
polygons
(smoothed edges)

Anti-aliased polygons
(smoothed edges)

What Does Anti-aliasing Do ?

Anti-aliasing makes these curved or slanting lines smooth again by adding a slight discoloration to the edges of the line or object, causing the jagged edges to blur and melt together. It also removes jagged edges by adding subtle color changes around the lines If the image is zoomed out a bit, the human eye can no longer notice the slight discoloration that antialiasing creates.

Do We really need Anti-aliasing?

Jaggies appear when an output device does not have a high enough resolution to represent a smooth line correctly. The pixels that make up the screen of the monitor are all shaped in rectangles or squares. Because lighting up only half of one of these square pixels is not possible.

The jagged line effect can be minimized by increasing the resolution of the monitor, making the pixels small enough that the human eye cannot distinguish them individually. This is not a good solution, however, because images are displayed based on their resolution. A single image pixel may take up many monitor pixels, making it impossible for a higher resolution monitor to mask the jagged edges. This is where anti-aliasing is required.

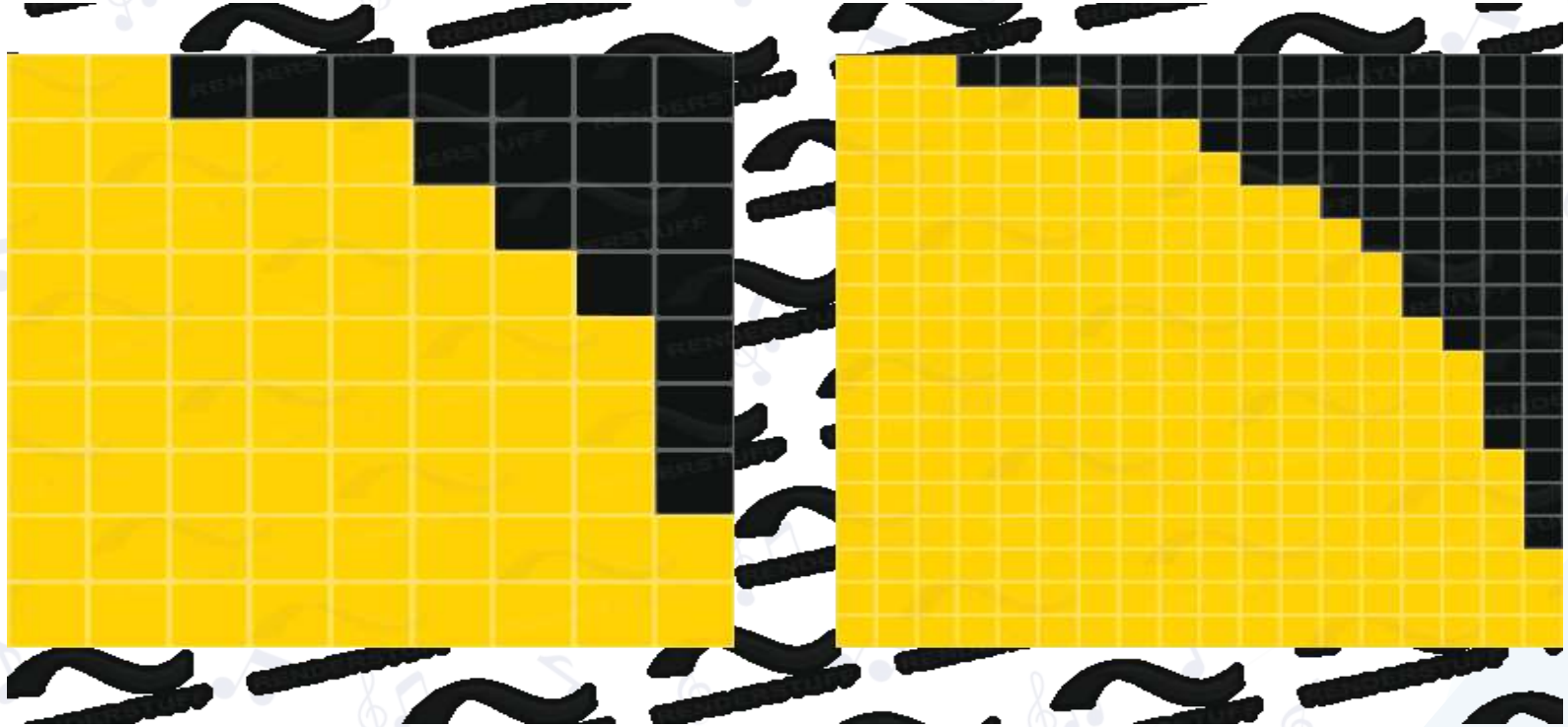
Anti-Aliasing Techniques

Anti-Aliasing techniques were developed to combat the effects of aliasing.
There are three main classes of anti-aliasing algorithms :

- As aliasing problem is due to low resolution, one easy solution is to increase the resolution. This increases the cost of image production.
- The image can be calculated by considering the intensities over a particular region. This is called Area Sampling.
- The image is created at high resolution and then digitally filtered. This method is called super sampling or post filtering and eliminates high frequencies which are the source of aliases.

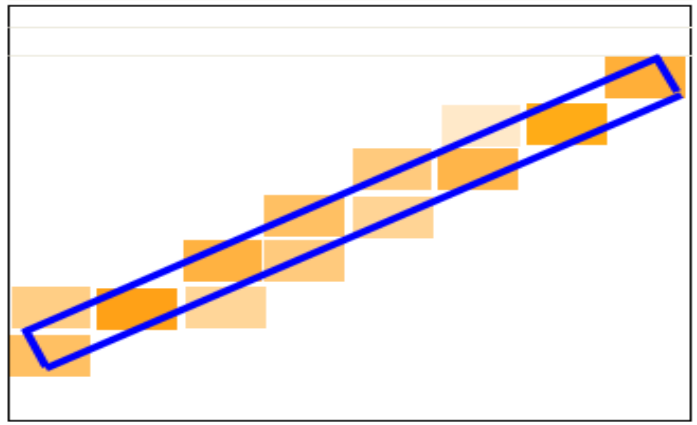
1. Anti-Aliasing : Increasing Resolution

- Doubling resolution in x and y
- This method only lessens the problem
- Costs 4 times memory, memory
- bandwidth and scan conversion time



2. Anti-Aliasing : Area Sampling

Area sampling approaches sample primitives with a box rather than spikes.
-- Requires primitives that have area (lines with 1 pixel width).
-- Sometimes referred to as pre-filtering.
-- Shade pixels according to the area covered by thickened line.
-- This is unweighted area sampling.



3. Anti-Aliasing : Post filtering

Super sampling or ***Post filtering*** is the process by which aliasing effects in graphics are reduced by increasing the frequency of the sampling grid and then averaging the results down. This process means calculating a virtual image at a higher spatial resolution than the frame store resolution and then averaging down to the final resolution. It is called ***post filtering*** as the filtering is carried out after sampling.

There are two *drawbacks* to this method

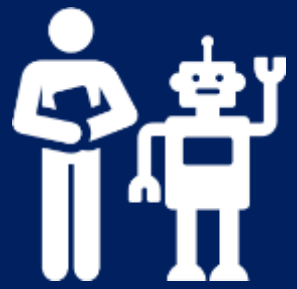
- The drawback is that there is a technical and economic limit for increasing the resolution of the virtual image.

- Since the frequency of images can extend to infinity, it just reduces aliasing by raising the Nyquist limit - shift the effect of the frequency spectrum.

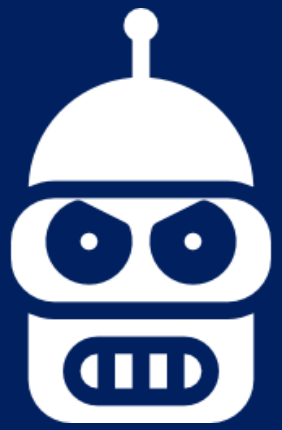
Anti-Aliasing : Post filtering (Conti.....)

Super sampling is basically a three stage process:

- A continuous image (x , y) is sampled at n times the final resolution. The image is calculated at n times the frame resolution. This is a virtual image.
- The virtual image is then low pass filtered
- The filtered image is then resampled at the final frame resolution.



THANK YOU



DO YOU HAVE ANY QUESTIONS?