Rasterization 1 (Triangles)

- 视锥
  - aspect ratio = width/height
  - vertical field of view(FOV)
  - 与n 推出l r t b

viewport(视口) transform

$$M_{viewport} = \begin{pmatrix} \frac{width}{2} & 0 & 0 & \frac{width}{2} \\ 0 & \frac{height}{2} & 0 & \frac{height}{2} \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

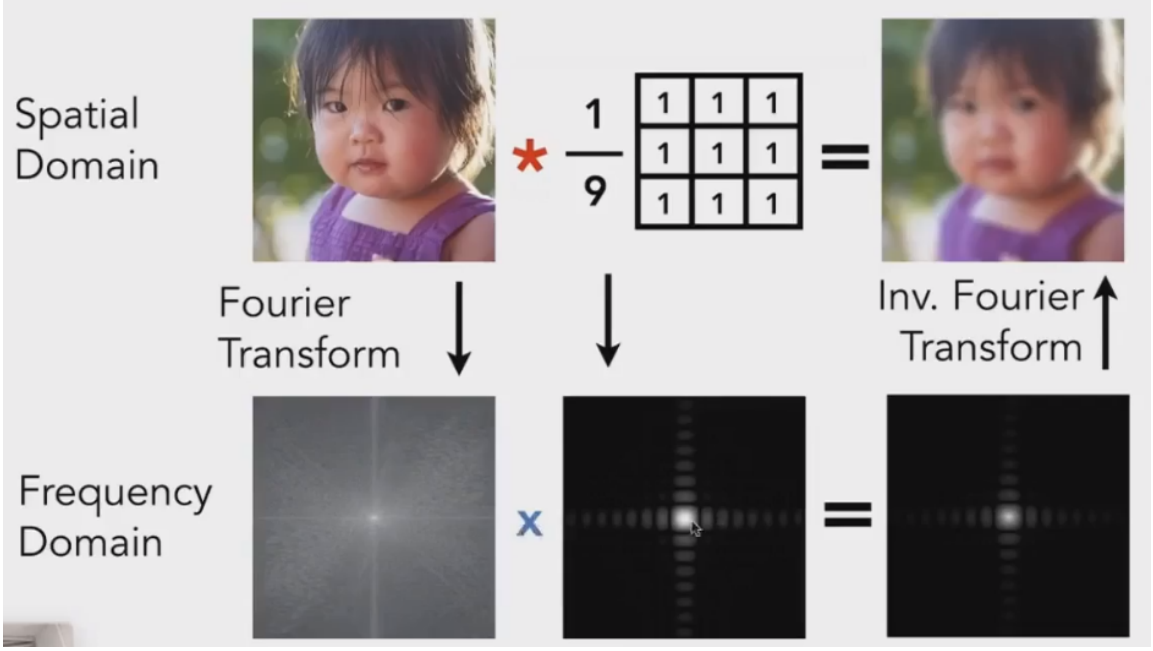
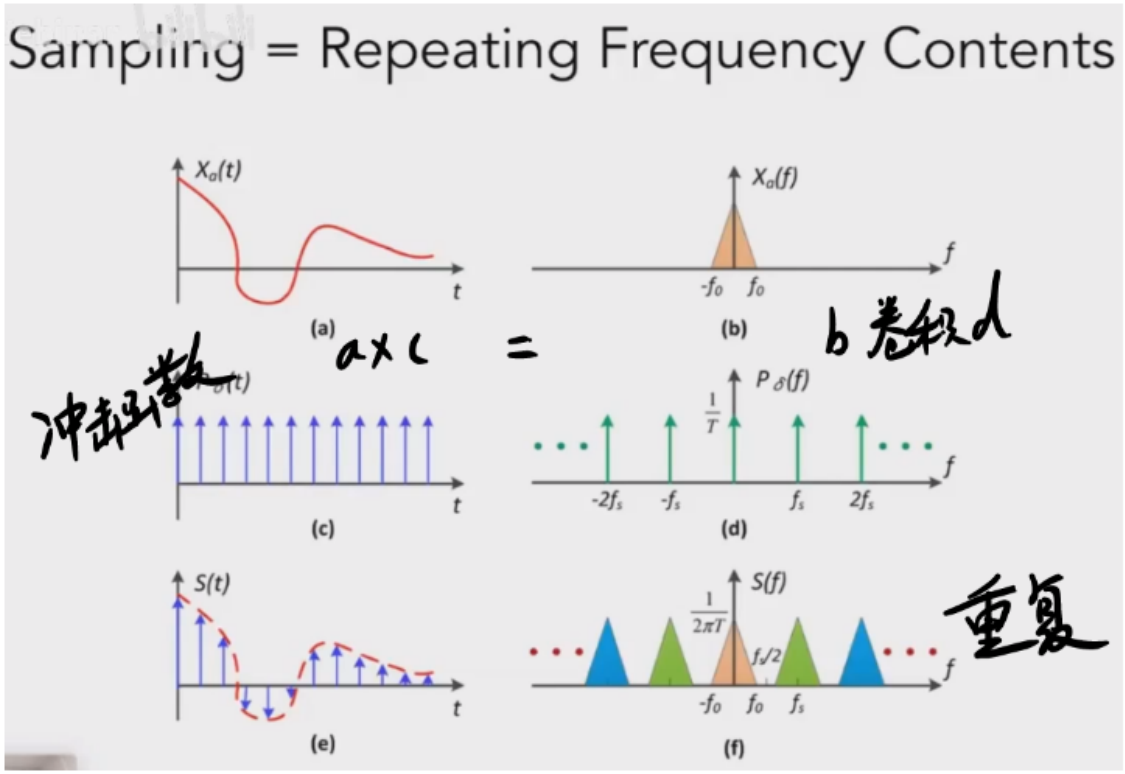
rasterizing triangles into pixels

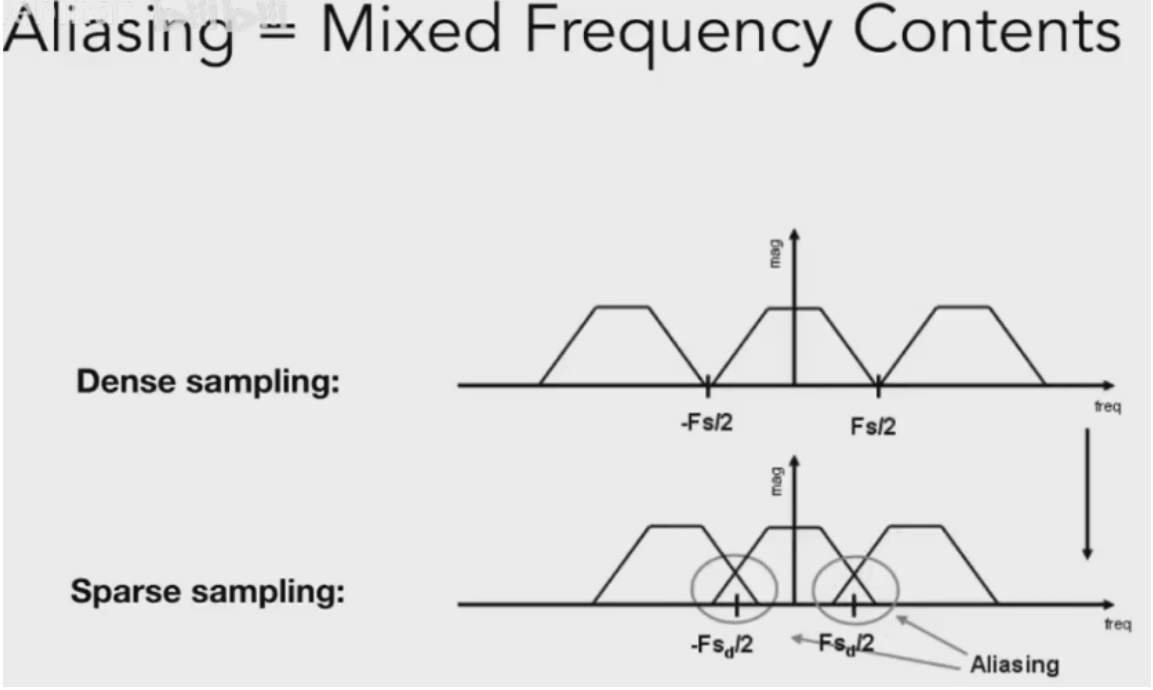
- sampling(采样) a function
- 光栅化加速
  - bounding box(包围盒)
  - 三角内部每行从左到右(适用 thin and rotated triangles)

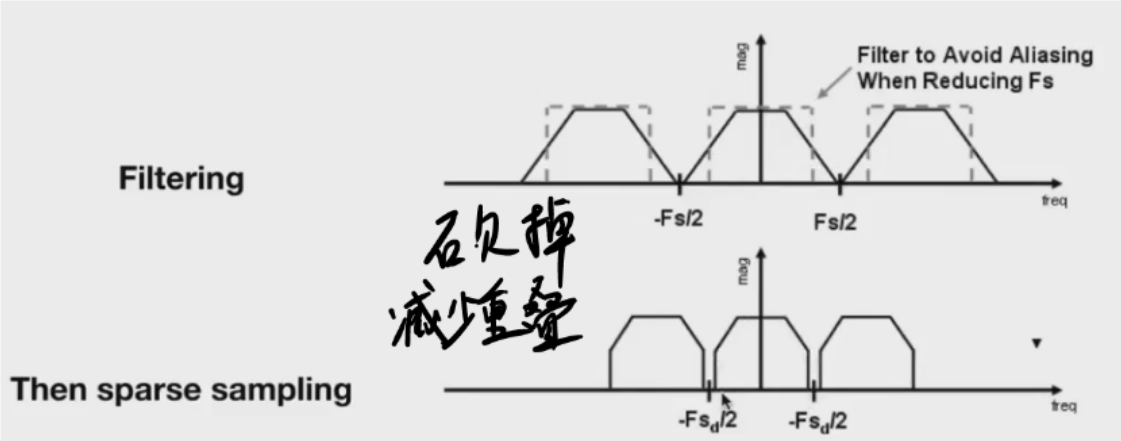
aliasing(jaggies)

Rasterization 2 (Antialiasing and Z-Buffering)

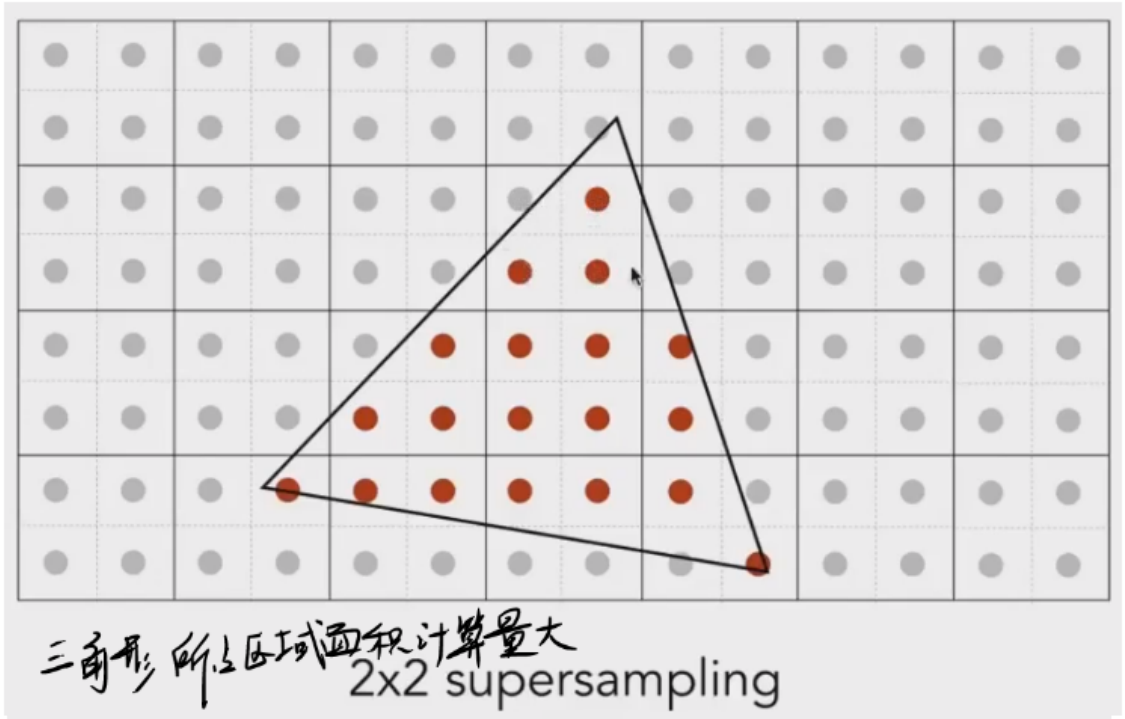
- antialiasing
  - theory
    - artifacts(erroes/mistakes/inaccuracies) in CG
      eg. 1)jaggies--sampling in space 2)moire patterns(摩尔纹)--images 3)wagon wheel illusion(车轮幻觉)--time
      采样跟不上变化频率
    - frequency domain(频域) f = 1/T
      - $$f(x) = \frac{A}{2} + \frac{2A\cos(t\omega)}{\pi} - \frac{2A\cos(3t\omega)}{3\pi} + \frac{2A\cos(5t\omega)}{5\pi} - \frac{2A\cos(7t\omega)}{7\pi} + \cdots$$
      - 傅里叶变换 f(x)→F(x)把函数变成不同频率段
    - filtering = convolution = averaging(时域卷积=频域乘积)

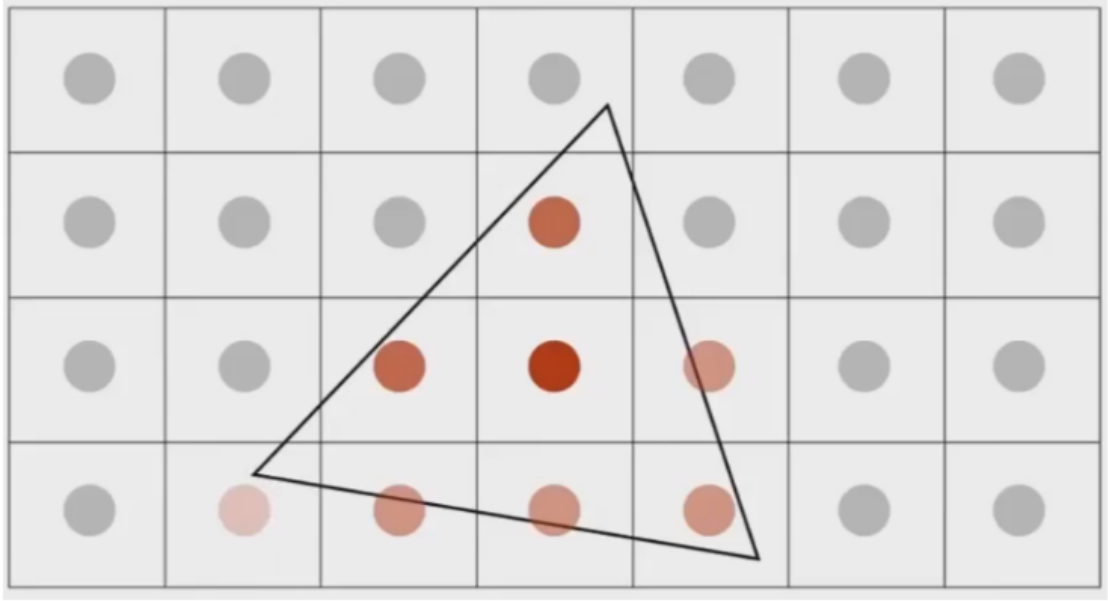
- 
Spatial Domain
1/9
Fourier Transform
Inv. Fourier Transform
Frequency Domain
- 采样
- 
Sampling = Repeating Frequency Contents
(a)
(b)
(c)
(d)
(e)
(f)
- 走样=频域复制混合

- 

- practice
  - 增加采样率
  - 先模糊(频域low pass或时域平均)再采样
    - 

  - eg.MSAA(multisampling antialiasing)





- FXAA(fast approximate antialiasing)
- TAA(temporal antialiasing)
- super resolution/sampling 超分辨率
- DLSS

- visibility/occlusion
  - Z-buffering