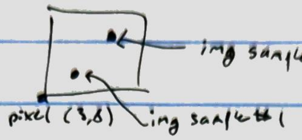
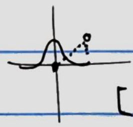
2023-06-14

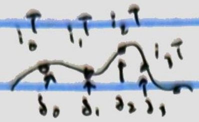
7.2 Sampling Interface



$(\underbrace{x, y}_{\text{sample pos offset in pixel}}, t, \overbrace{u, v}^{\text{lens pos}}, \underbrace{[(u_0\ u_1), (u_2\ u_3), (u_4\ u_5), (u_6\ u_7)]}_{\text{some monte carlo light transport, ie: 4 points on area light}}$



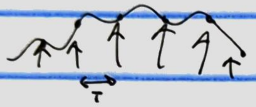
[ ] Q: why Filter::radius is V2 instead of float?

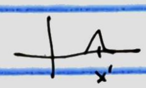


$$T \sum_i \delta(x - iT)\, f(iT)$$

$$\left(Ш_T(x) f(x)\right) \otimes r(x)$$

$$\int_{-\infty}^{\infty} T\left(\sum_i \left(\delta(x' - iT)\, f(iT)\right)\right) r(x' - iT)\, dx'$$





well its
zero at all
non iT points

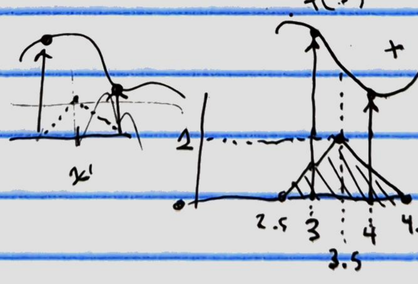
$$\tilde{f}(x) = T \sum_{i=-\infty}^{\infty} f(iT)\, r(x - iT)$$

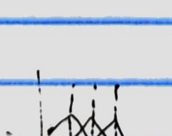
what about $\frac{T}{2}$?

$f(3) \times hat_{3.5}(3)$

$+ f(4) \cdot hat_{3.5}(4)$

$= \frac{f(3) + f(4)}{2}$





2023-06-09

PBRT v3, 7.1 Sampling ~~Theorey~~ Theory

Fourier analysis can evaluate reconstructed fn quality

7.1.1

$$F(\omega) = \int_{-\infty}^{\infty} \underbrace{f(x)}^{\text{1D fn}} e^{-i 2\pi \omega x} \, dx$$ fourier xform of 1D fn (7.1)

"Fourier analysis eq"
"fourier xform"

$\underbrace{e^{ix} = \cos x + i \sin x}$

for simplicity, only even fn's

Fourier transform operator $\mathcal{F}$ ← linear op

freq → spacial domain

$$f(x) = \int_{-\infty}^{\infty} F(\omega) e^{i 2\pi \omega x} \, d\omega$$ (7.2)

"fourier synthesis eq"
"inv fourier xform"

2023-~~07~~06-13

7.1.2

samples via "dirac comb" / "shah" / "impulse train"

$$Ш_T(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT)$$ //wiki:

Cyrillic letter sha

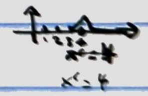
$$III_T(x) = T \sum_{i=-\infty}^{\infty} \delta(x - iT)$$ //book

$$III_T(x) f(x) = T \sum_i \delta(\cancel{x-iT}\ x-iT) f(iT)$$

$$(III_T(x) f(x)) \otimes r(x)$$ reconstruction operator, ie triangle $r(x) = \max(0, 1-|x|)$

convolution operator $f(x) \otimes g(x) = \int_{-\infty}^{\infty} f(x') \underbrace{g(x-x')}_{\text{ie: shifted hat}} dx'$

$$\tilde{f}(x) = T \sum_{i=-\infty}^{\infty} f(iT) r(x - iT)$$



ie: $f(4) \otimes g(4) = \int f(x') g(x-4) \, dx'$

$$\mathcal{F}(f(x) g(x)) = F(\omega) \otimes G(\omega)$$

$$\mathcal{F}(f(x) \otimes g(x)) = F(\omega) G(\omega)$$ (7.3)