Fast Feature Field (F^3)

Hash encode event coordinates into a feature space

Lookup

Interpolation

F

F

φ

L levels of hashing
F features per level

$n = L \times F$

Deep Set-based representation

Pool hash-encoded features along time

$\bar{\varphi}(t, u) \in \mathbb{R}^n$

Convolutions ρ to smooth features $\bar{\varphi}(t, \cdot)$

$\mathrm{F}^3(t, u) = \hat{\xi}(t, u) \in \mathbb{R}^p$

ψ predicts future events from $\mathrm{F}^3(t, u)$

$\hat{e}^+(s, u)$

$l_t(\varphi, \rho)$

Event Volume

pixel space
$u \in \Omega \subset \mathbb{Z}^2$

$t - \Delta t$

$t \in \mathbb{Z}$

$t + \Delta t$

past events
$e^-(s, u) : s \in [t - \Delta t, t)$

future events
$e^+(s, u) : s \in (t, t + \Delta t]$

120 Hz @ HD

Downstream Tasks

Segmentation

F^3

SegFormer

47.3M parameters
27 Hz @ HD

Optical Flow

F^3

Convolutional Flow Head

28K parameters
75 Hz @ HD

Monocular Depth

F^3

Depth Anything

97.5M parameters
46 Hz @ HD

Stereo Disparity

F^3 cam 1

F^3 cam 2

Semi-global Block Matching

No parameters
13 Hz @ HD (CPU)