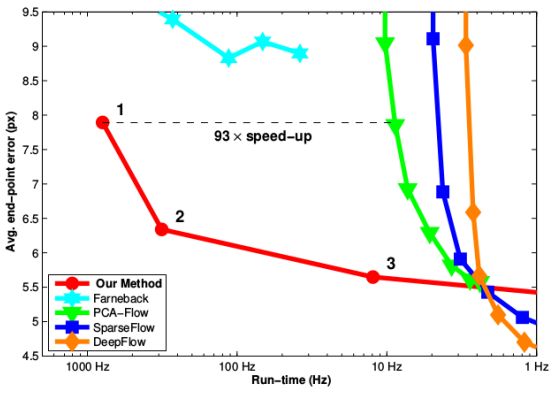
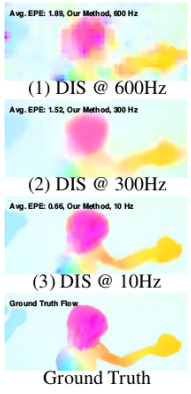
Fast Optical Flow using Dense Inverse Search

T. Kroeger, R. Timofte, D. Dai, L. V. Gool (Arxiv 2016)





Algorithm 1 Dense Inverse Search (DIS)

Set initial flow field $\mathbf{U}_{\theta_{ss}+1} \leftarrow \mathbf{0}$
for $s = \theta_{ss}$ to θ_{sf} **do**
    (**1.**) Create uniform grid of N_s patches
    (**2.**) Initialize displacements from $\mathbf{U}_{s+1}$
    for $i = 1$ to N_s **do**
        (**3.**) Inverse search for patch i
    (**4.**) Densification: Compute dense flow field $\mathbf{U}_s$
    (**5.**) Variational refinement of $\mathbf{U}_s$

- Very low time complexity for dense optical flow
- Inverse search for a uniform grid of patch correspondences
  - Inverse Lukas-Kanade algorithm proposed before
- Dense displacement field creation through patch aggregation along multiple scales
  - Coarse-to-fine scheme
  - Densification as weighted averaging to displacement estimates
- Variational refinement
- 300Hz up to 600Hz on a single CPU core (human-level temporal resolution)
- Evaluated on Sintel and KITTI benchmarks