

# Demos of Visual Tracking

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# KLT tracker: 2D flow-based region tracker

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*[Shi and Tomasi, "Good features to track." Proc IEEE CVPR, 1994]*



# 2D flow-based tracking

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*[Sand and Teller, CVPR '06]*



# 2D flow-based tracking

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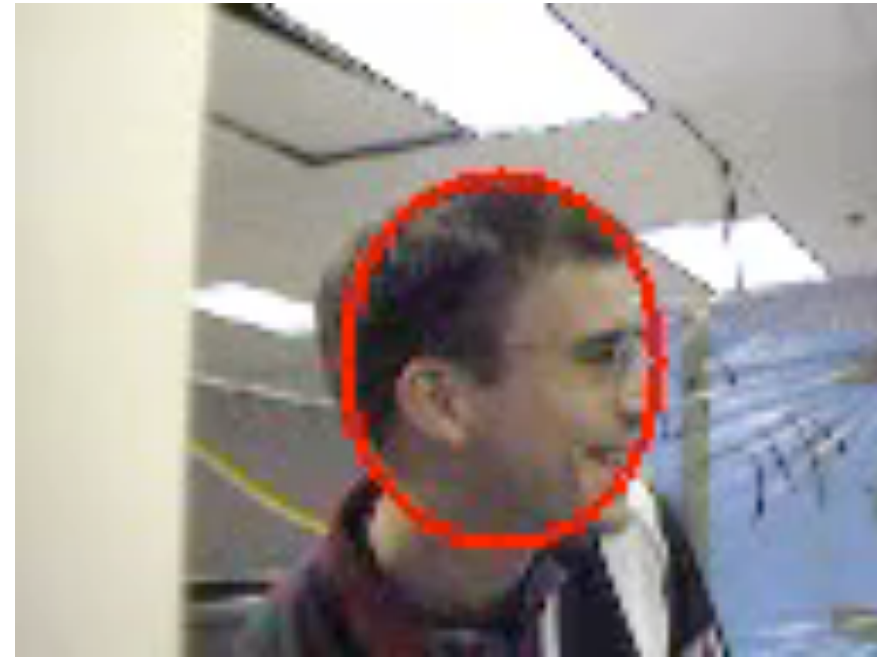


*[Sand and Teller, CVPR '06]*



# 2D region-based tracking

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*[Birchfield, "Elliptical head tracking using intensity gradients and color histograms." Proc IEEE CVPR, 1998]*

# Tracking in xy-rgb space with mean-shift

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*[Comaniciu, Ramesh & Meer, "Kernel-Based Object Tracking", IEEE Trans PAMI '03]*

# Tracking with robust online appearance models

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*[Jepson, Fleet, & El-Maraghi, "Robust, on-line appearance models for visual tracking." IEEE Trans. PAMI, 2003]*

# Tracking with robust online appearance models

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*[Jepson, Fleet, & El-Maraghi, "Robust, on-line appearance models for visual tracking." IEEE Trans. PAMI, 2003]*



# Car tracking with background subtraction

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*[Koller, Weber & Malik, "Robust multiple car tracking with occlusion reasoning." Proc ECCV, 1994]*

# People tracking with background subtraction

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*[Haritaoglu, Harwood & Davis, "W4: Who, when, where, what: A real-time system for detecting and tracking people." Proc Face & Gesture, 1998]*



# 2D contour tracking

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(6D affine state, 100 particles)



(6D affine state, 1200 particles)

*[Isard & Blake, "Condensation - conditional density propagation for visual tracking." IJCV, 1998]*

## 2.1D blob tracking

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**State:** number of people, their positions/velocities on ground plane, & simple shape models (10 dimensions/person)

**Appearance:** filter response histograms for background, and foreground people

**Dynamics:** damped 2<sup>nd</sup>-order model for position/velocity, 1<sup>st</sup>-order for shape model

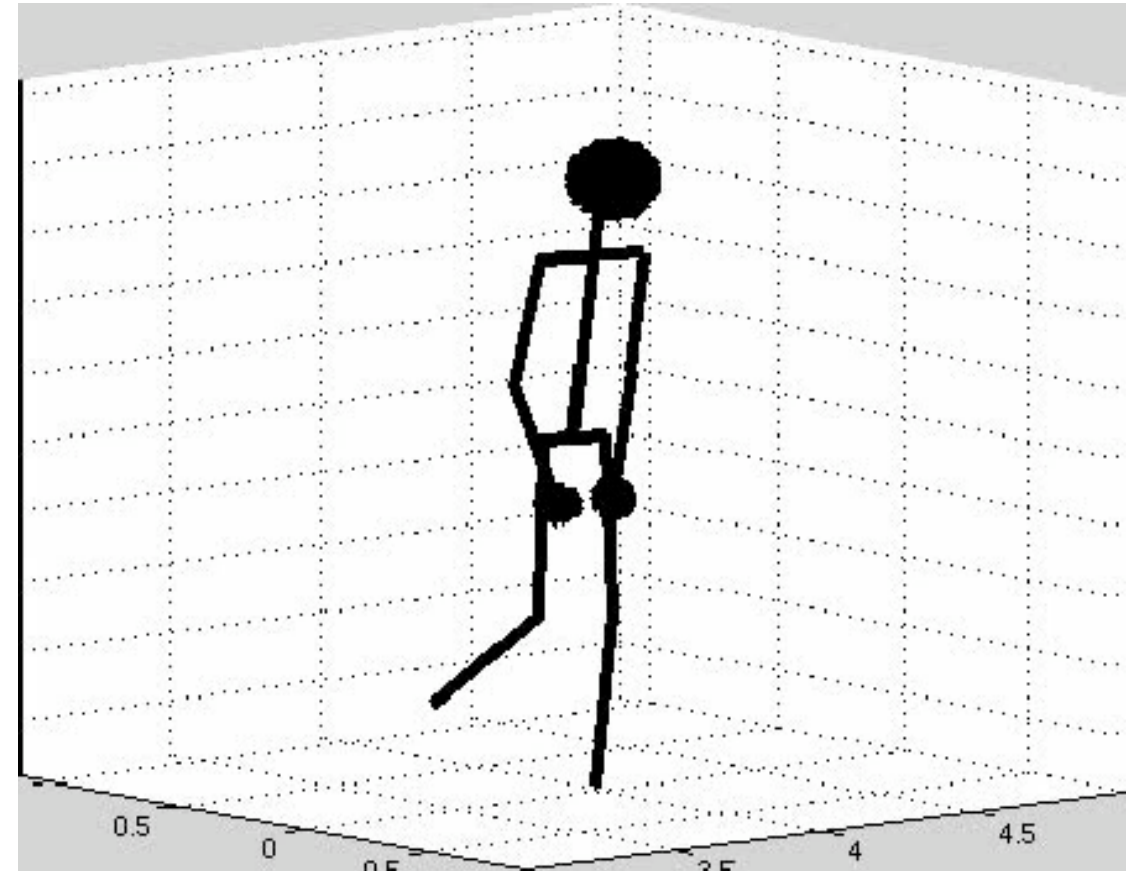
(1 person ~500 particles, 2-3 people >10,000)

*[Isard and MacCormick, "Bramble: A Multiple Blob Bayesian Tracker." Proc ICCV, 2001]*



# 3D pose tracking

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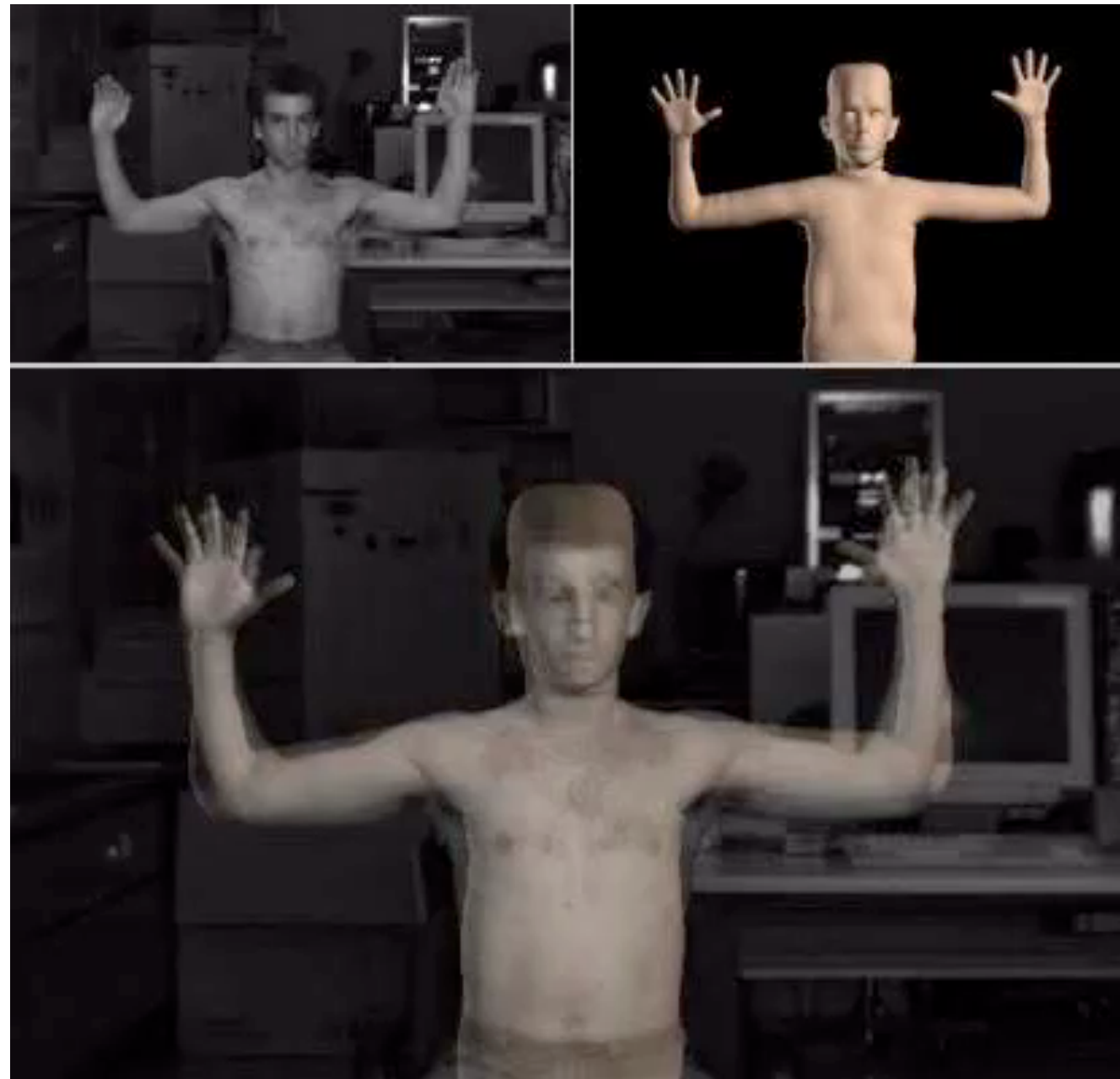


Tracking walking people with a subspace “walking” prior and a particle filter (15000 particles, manual initialization)

*[Sidenbladh, Black & Fleet, “Stochastic tracking of 3D human figures using 2D image motion.” Proc ECCV, ‘00]*

# 3D pose tracking

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Stereo depth input, implicit shape model, and hill climbing

*[Plankers & Fua, "Articulated soft objects for multiview shape and motion capture." IEEE Trans PAMI, 2003]*

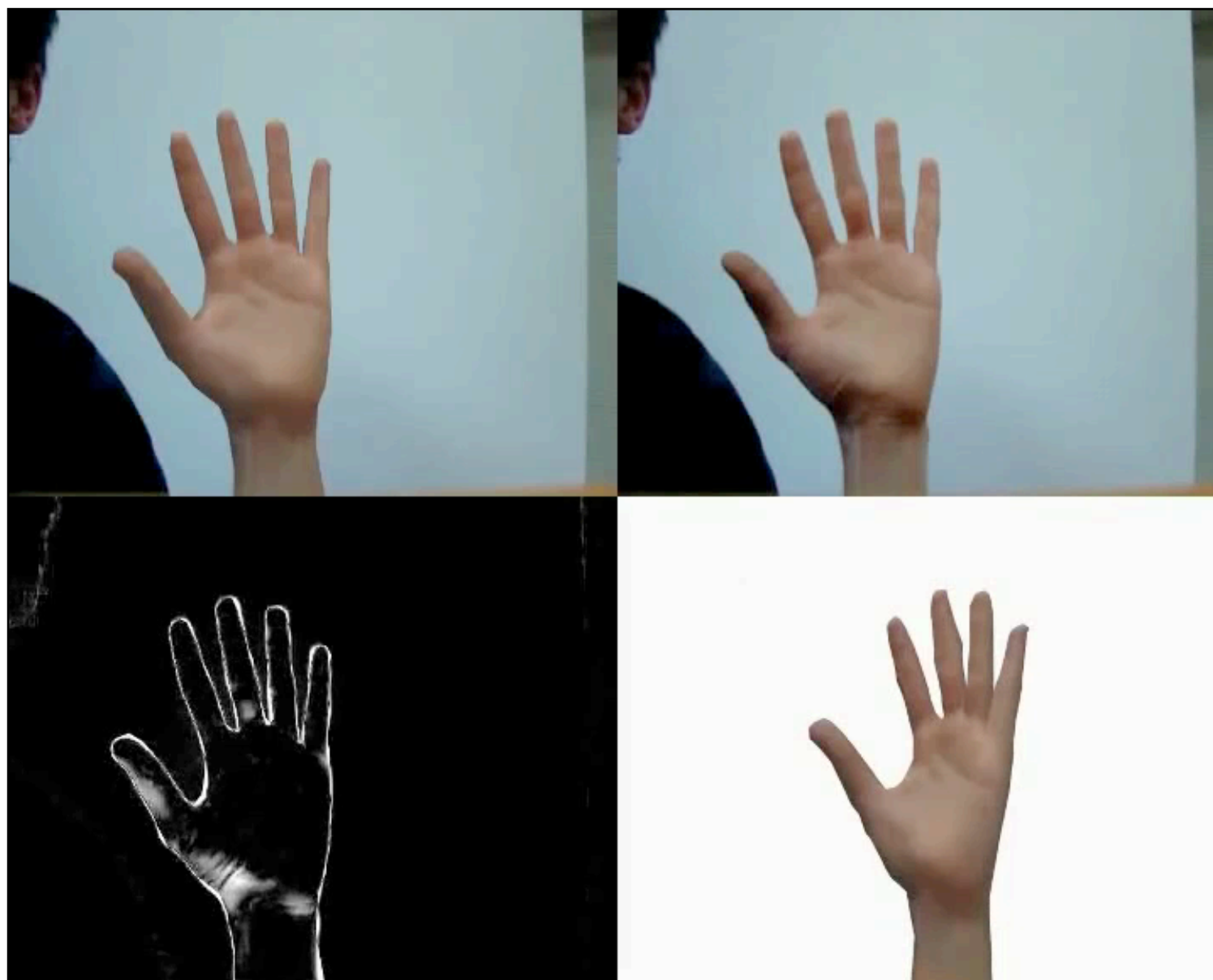


# 3D hand tracking with rich generative models

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*model*

*input*



*residual*

*novel view*

*[de La Gorce, Fleet and Paragios, IEEE Trans PAMI, 2010]*

# Tracking hockey players with learned proposals

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**State:** number of players, positions & velocities (in rink coords)

**Appearance:** color histograms for top & bottom of body

**Factored Posterior:** independent filters applied to players  
(unless players in close proximity)

*[Okuma et al., "Boosted Particle Filter." ECCV '04]*



# Rao-Blackwellized particle filter

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*[Khan, Balch, Dellaert, "A Rao-Blackwellized particle filter for EigenTracking" Proc CVPR, 2004]*

# Surface mesh + feature detection

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training exemplar



virtual texture



[Pilet, Lepetit & Fua. "Fast non-rigid surface detection, registration and realistic augmentation". IJCV, 2008]