

Marked Point Processes for Crowd Counting

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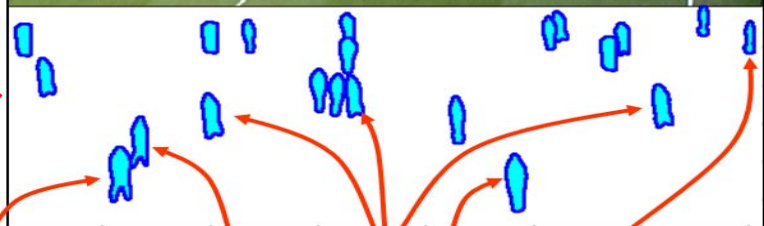
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A crowd scene as a realization of an MPP

$$\pi(\mathbf{o}|I) \propto \pi(I|\mathbf{o}) \prod \pi(\mathbf{o}_i)$$

$$\pi(\mathbf{o}_i) = \pi(p_i) \underbrace{\pi(w_i, h_i, \theta_i|p_i)}_{\blacklozenge} \underbrace{\pi(s_i)}_{\blacktriangle}$$

\blacklozenge *determine location, scale, orientation*

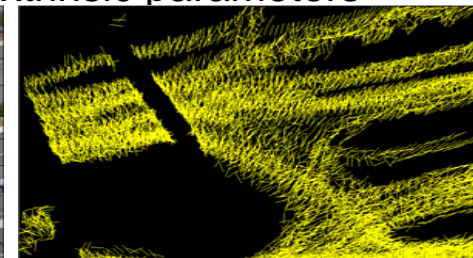


\blacktriangle *determine body shape*

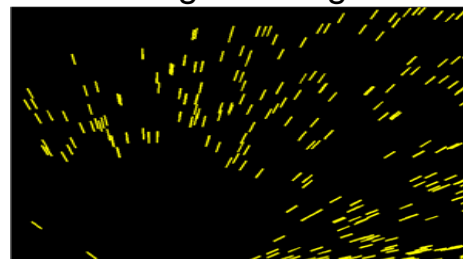
\blacklozenge Estimating extrinsic parameters



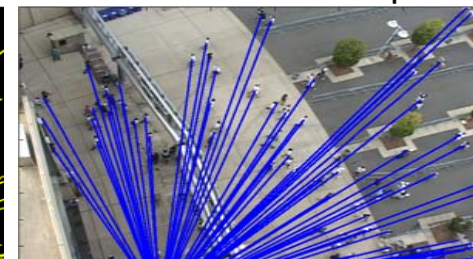
Original image



Orientation axes of a sequence

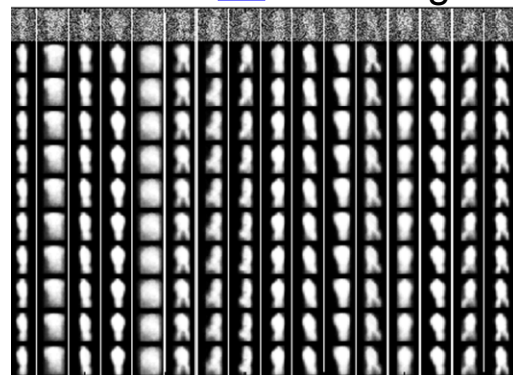


Inliers found by RANSAC

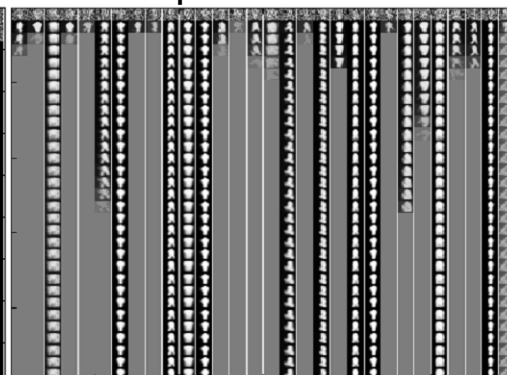


Vertical vanishing point

\blacktriangle Learning intrinsic shape classes



EM iterations



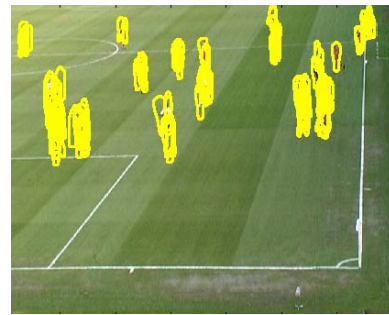
Bayesian EM with Dirichlet prior

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- Bayesian approach

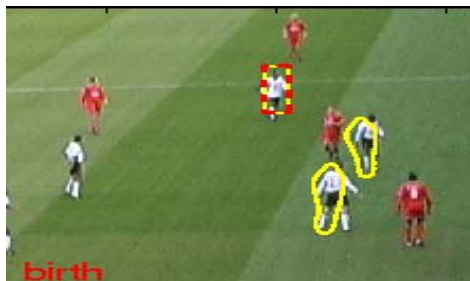


MPP prior

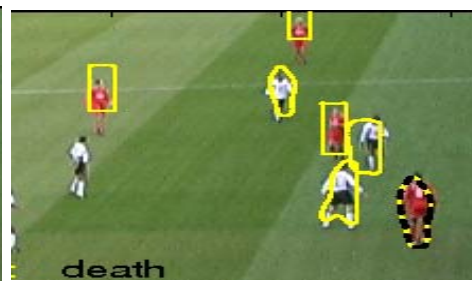


Combined with likelihood

- Estimating configurations by MCMC



birth: add person



death: delete person



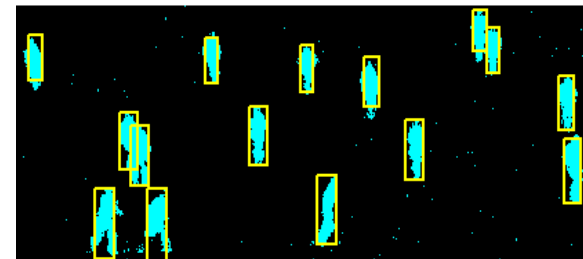
update location: random walk



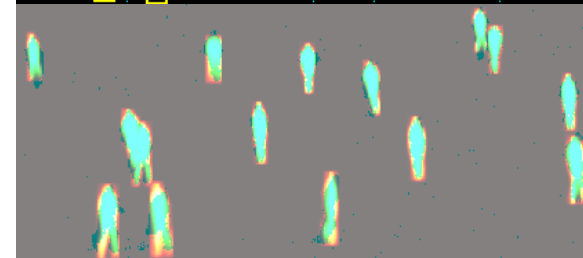
update shape: change shape

- Delineate pedestrians in a foreground mask using shape coverings

rectangular
covering



shape
covering



- Adapt to different videos by learning the shape models



Training samples

Automatically
learned shapes