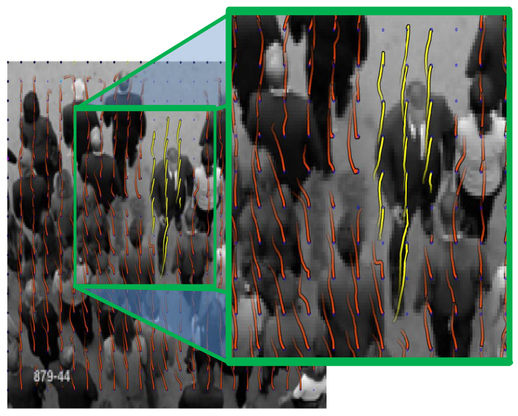
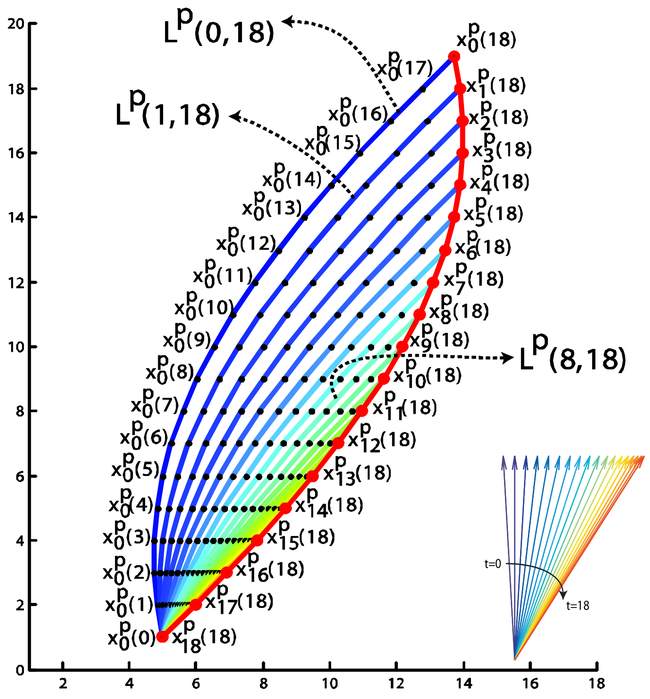
STREAKLINES, POTENTIALS, AND CROWD ANSLYSIS

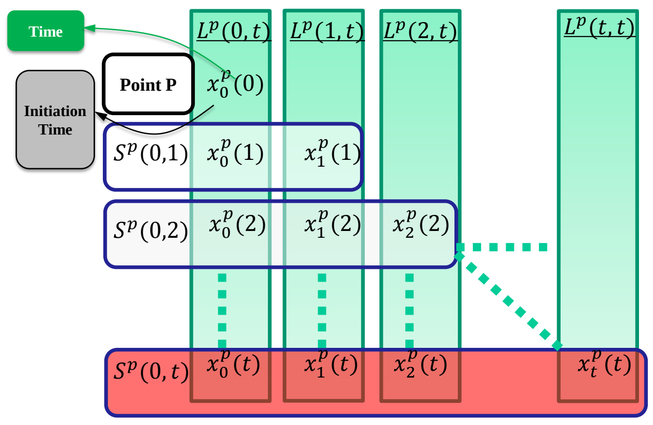
Mehran R., Moore B., and Shah M.
Computer Vision Lab, University of Central Florida

I. Abstract

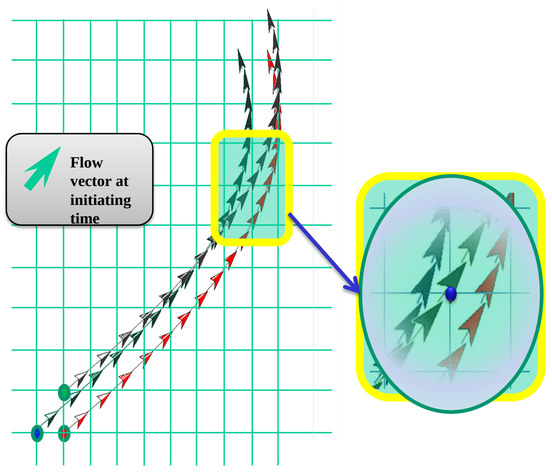
Streaklines are the traces in a fluid flow of an injected color material, which are transported with the flow and are used for visualization. Streaklines may be used in a similar way to transport information about the scene, and they are obtained by repeatedly initializing a fixed grid of particles at each frame, then moving both current and past particles using optical flow. A streakline representation of the flow is presented to solve computer vision problems involving crowd and traffic flow.

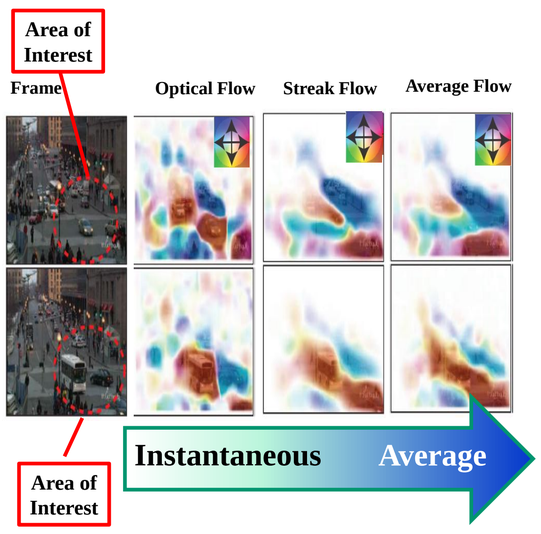






II. Streak Flow

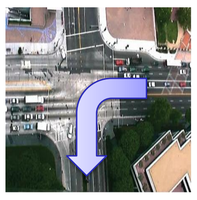




III. Potentials

$$\varphi(x,y) = \varphi_0 + \frac{1}{2}\int_0^x (u_r(s,y) + u_r(s,0))\,ds + \frac{1}{2}\int_0^y (v_r(x,s) + v_r(0,s))\,ds,$$

$$\psi(x,y) = \psi_0 + \frac{1}{2}\int_0^y (u_c(x,s) + u_c(0,s))\,ds - \frac{1}{2}\int_0^x (v_c(s,y) + v_c(s,0))\,ds.$$

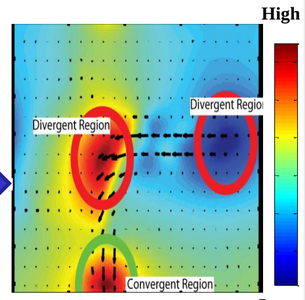


Velocity Potential φ

Regions of

- Entry
- Exit
- Escaping
- Gathering
- Turning

Changes in Flow (non-curling)

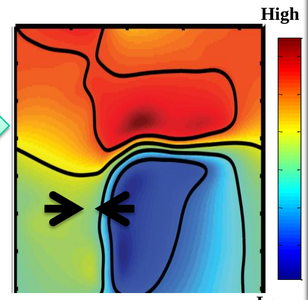


Stream Function ψ

Regions of

- Consistent and Steady flow

Steady Flow (non-divergent/convergent)



IV. Algorithms and Results