FLOW LOOKUP AND BIOLOGICAL MOTION PERCEPTION

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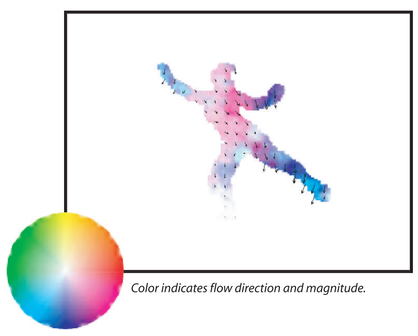
ABSTRACT

Optical flow provides a key for recognizing and tracking the 3-dimensional pose of human subjects in monocular video. A pose tracker based upon flow data can successfully follow more difficult movements than prior work using silhouettes. Furthermore, flow recognition can model human abilities in perceiving biological motion from sparse input. The flow lookup tracker can reconstruct a common biological motion (walking) from images containing only point light sources attached to the joints of the moving subject.

FLOW LOOKUP TRACKING ALGORITHM

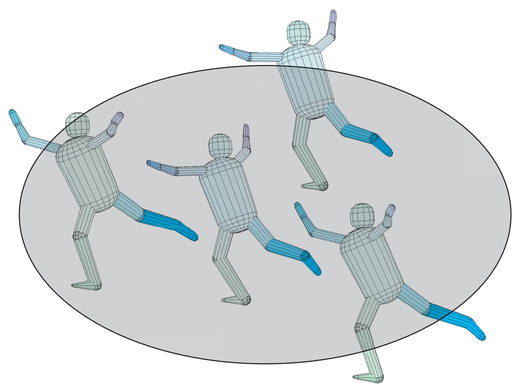
I. The input video provides the raw data to derive the optical flow and foreground segmentation in each frame.

II. Moments of the foregound optical flow characterize the instantaneous pose and motion in each frame.



III. Using this key, poses with similar qualities can be retrieved from a library.

IV. Armed with a pool of likely candidate poses at each frame of the input video, Markov chain optimization selects the most likely trajectory of poses using smoothness criteria and the degree of match to the input video. This solution may then be further optimized.



CONCLUSIONS

Flow recognition makes it possible to track difficult sequences more accurately.

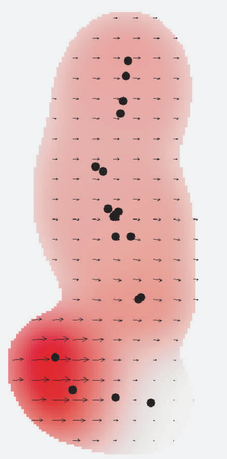
A system trained to track pose in standard video can adapt to track point light displays, as humans can.

THE JOHANSSON EFFECT

Subjects shown videos of points moving as though attached to the joints of a walking person readily perceive the motion as human.

Further studies have shown that this ability is surprisingly robust, and captures a great deal of information. For example, most subjects can identify the gender of the walker.

Familiarity plays a key role in the ability to perceive motion in point-light displays. Upside-down displays and unusual motions are not readily identified.



Flow fields inferred from point motions can serve as keys for pose lookup.

In this manner, the standard flow lookup tracker can be applied to point light displays.

The full walking motion is recovered for both side and rear views.