

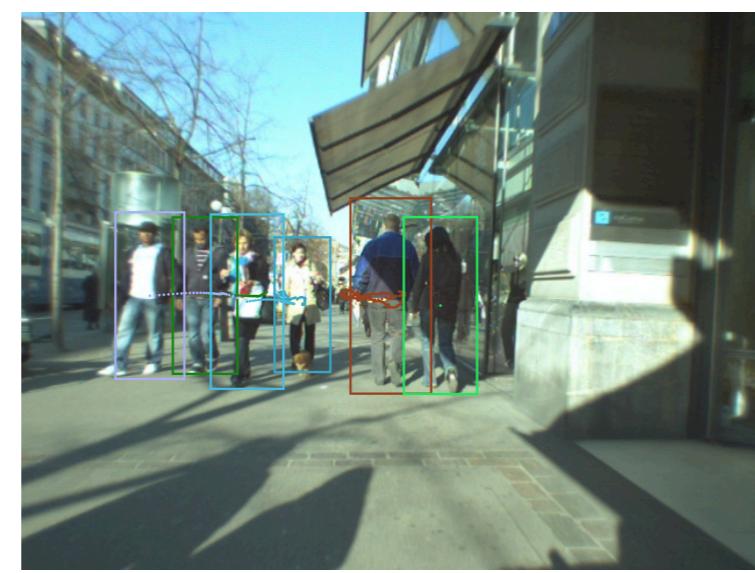
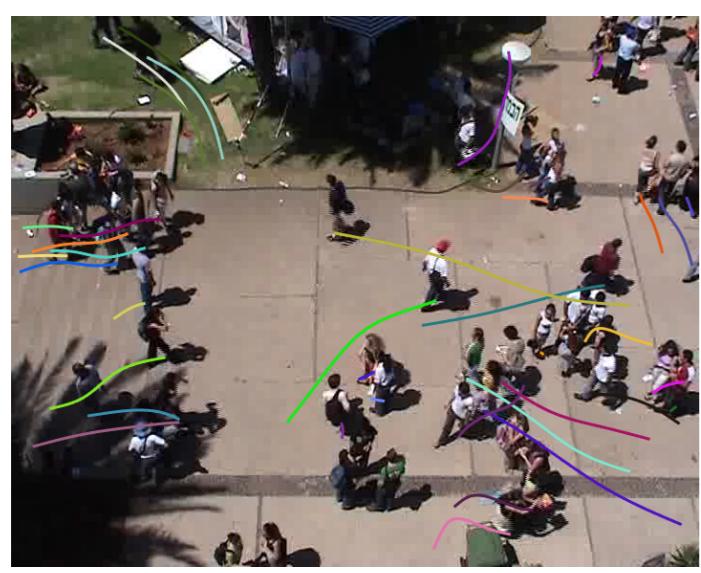
MTTV: an interactive trajectory visualization and analysis tool

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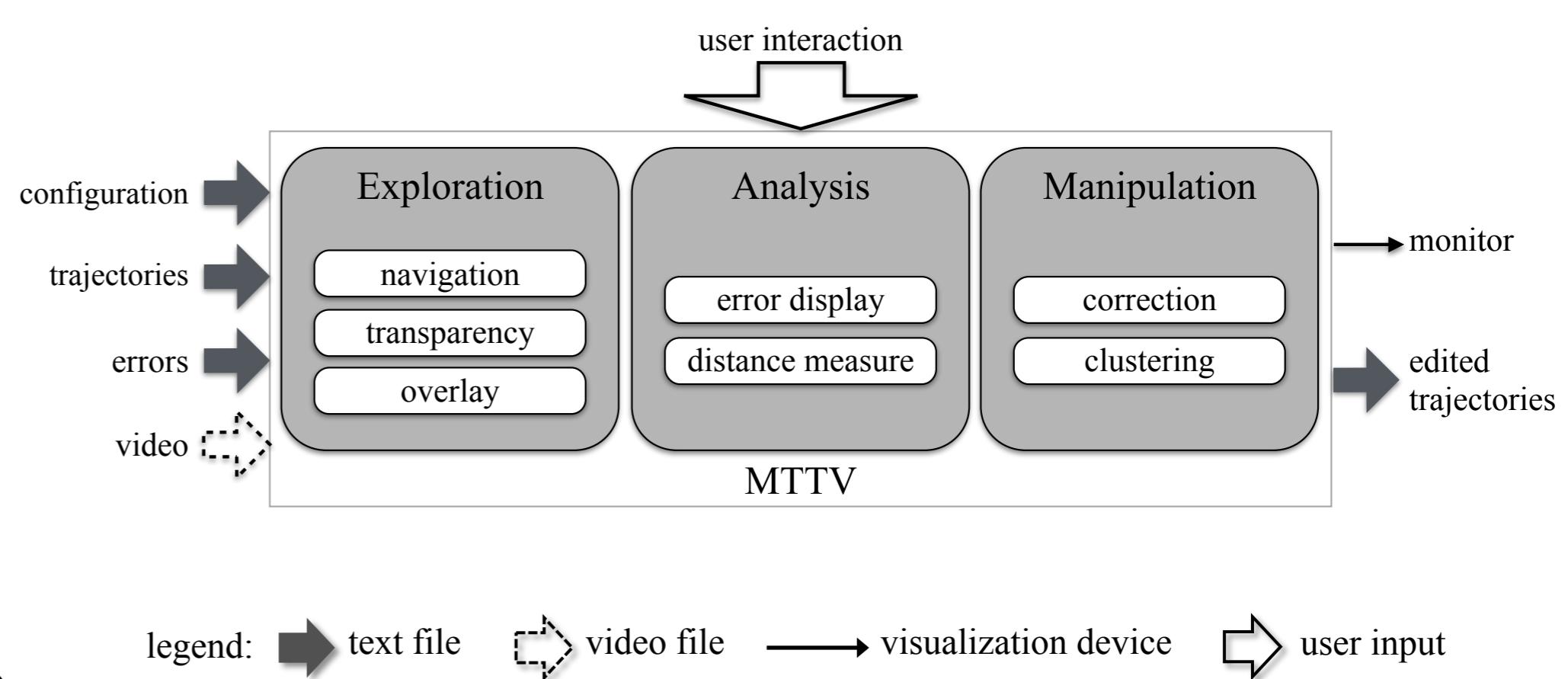
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1. Motivation

- Motion pattern (trajectories) analysis
- Behavioral studies of cells [1], insects [2] or humans [3]
- Localization and analysis of errors generated by object trackers [4]



2. Multi-Target Trajectory Visualization (MTTV)



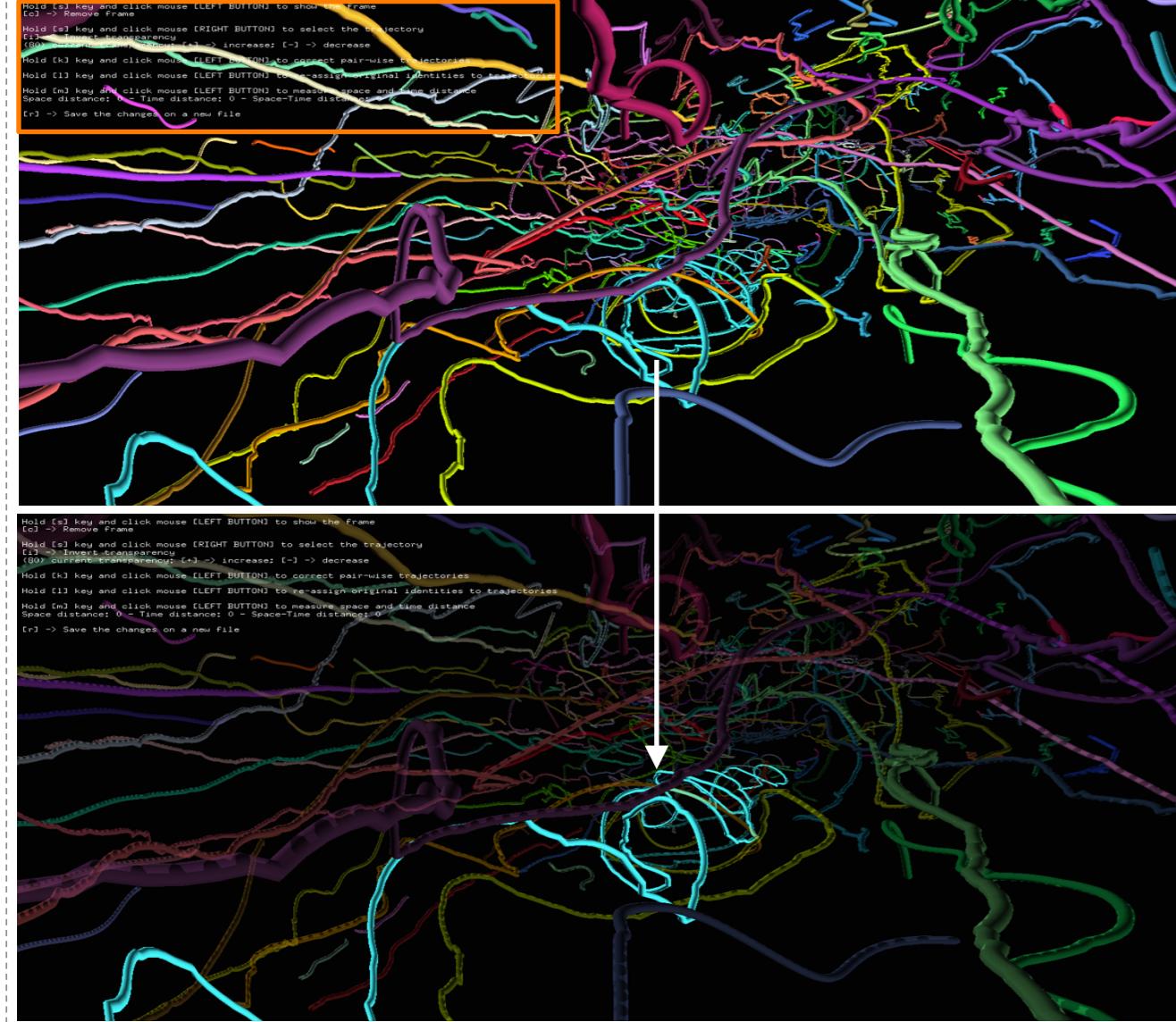
3. Exploration

- Space + time trajectory visualization
- Overlay on and navigation with video frames

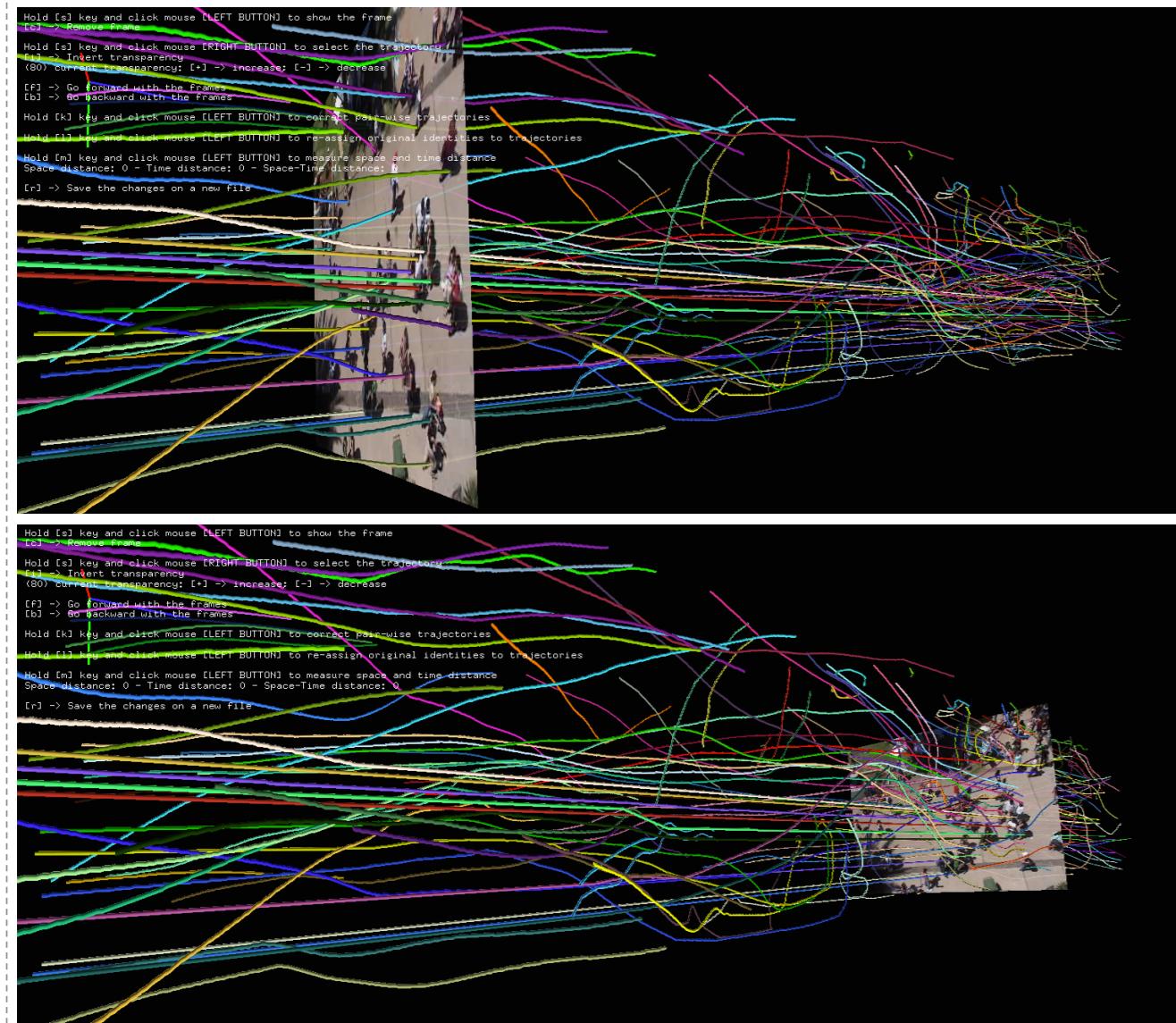
Commands

```
Hold [s] key and click mouse [LEFT BUTTON] to show the frame
[s] → Remove frame
Hold [s] key and click mouse [RIGHT BUTTON] to select the trajectory
[s] → Invert transparency
(80) current transparency; [+/-] → increase; [-] → decrease
Hold [k] key and click mouse [LEFT BUTTON] to correct pair-wise trajectories
Hold [l] key and click mouse [LEFT BUTTON] to re-assign original identities to trajectories
Hold [m] key and click mouse [LEFT BUTTON] to measure space and time distance
Space distance: 0 - Time distance: 0 - Space-Time distance: 0
[s] → Save the changes on a new file
```

Transparency to highlight tracks



Video overlay and navigation



4. Analysis

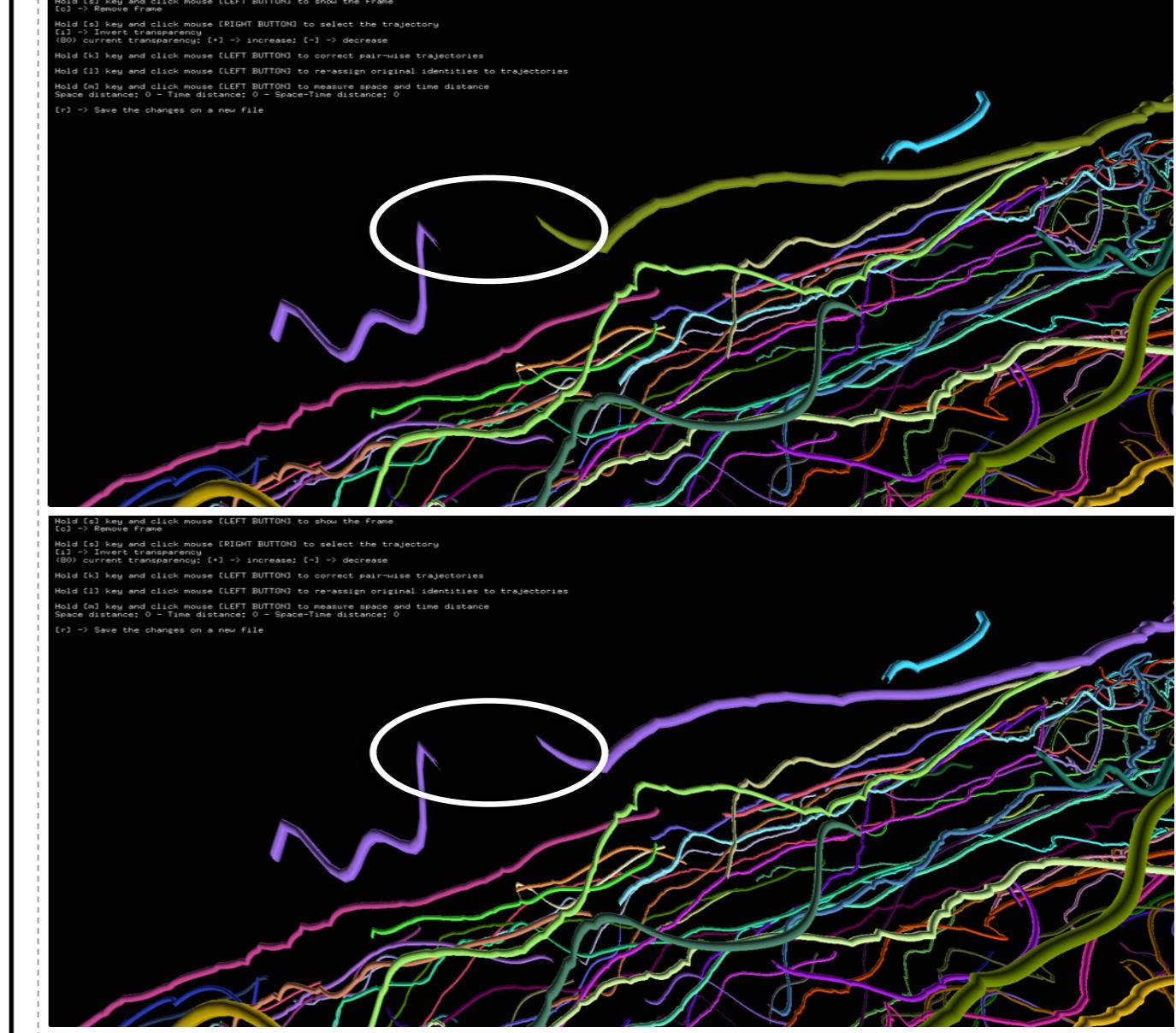
- Overlay of points of interest
 - color and shape based representation
 - visual assessment of tracking errors



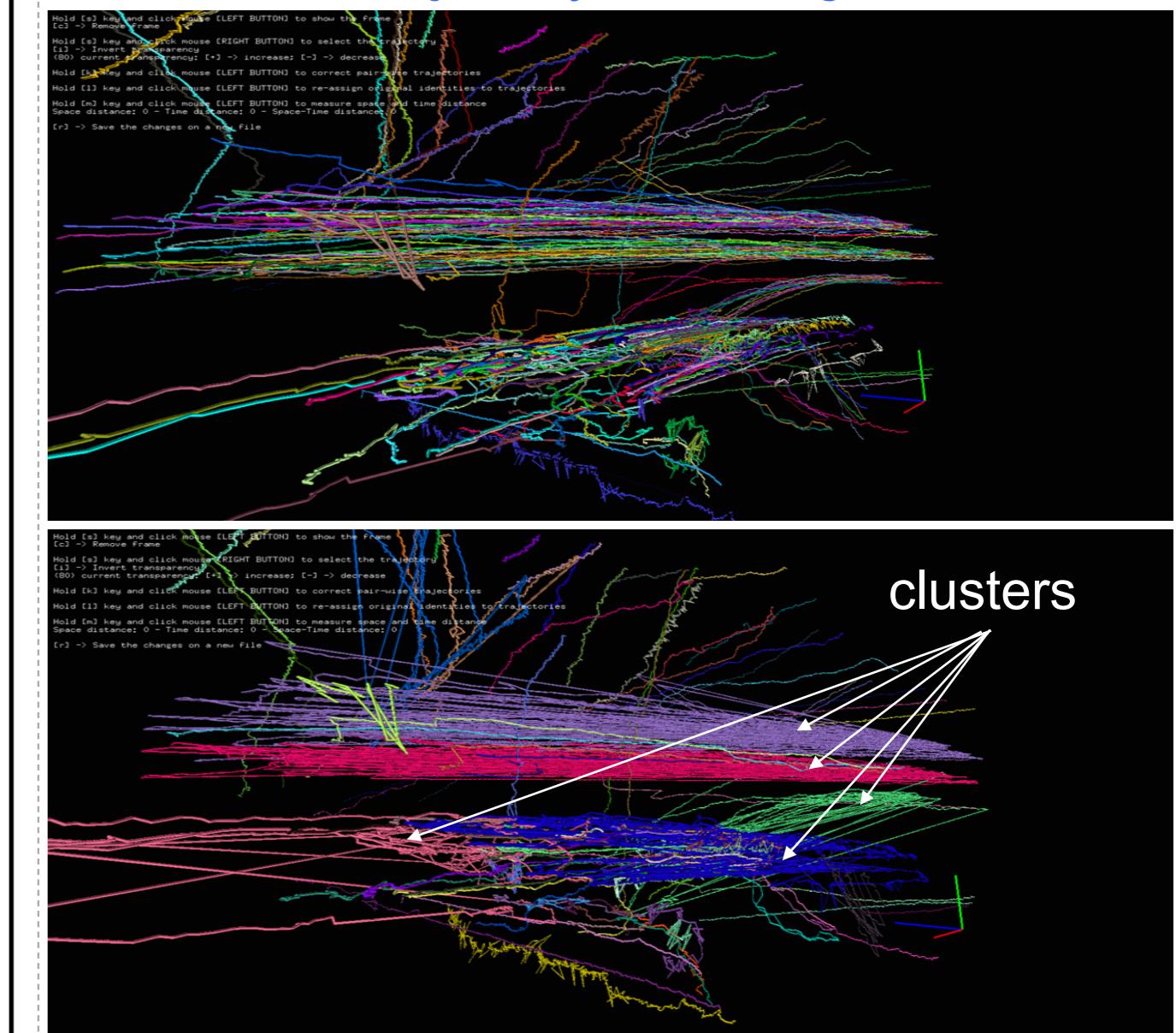
5. Manipulation

- Trajectory modification by the user
 - error correction
 - manual annotation (labeling) for
 - trajectory clustering
 - trajectory of interest selection

Label (color) transferring between tracks



Trajectory clustering



6. Future work

- Embed OpenCV features for OpenFrameworks to perform online visual assessment results (e.g. clustering)
- Visualize velocity direction along each trajectory
- Interpolate fragmented trajectories

<http://www.eecs.qmul.ac.uk/~andrea/mttv.html>



References

- [1] K. Li et al., "Cell population tracking and lineage construction with spatiotemporal context," *Medical Image Analysis*, vol. 12, no. 5, pp. 546-566, Oct 2008
- [2] T. Fasciano, A. Dornhaus and M. Shin, "Ant tracking with occlusion tunnels," *Proc. of Winter Conf. on Applications of Computer Vision*, Steamboat Springs, CO, USA, Mar 2014
- [3] F. Poiesi and A. Cavallaro, "Tracking multiple high-density homogeneous targets," *IEEE Trans. on Circuits and Systems for Video Technology*, (early access) 2014
- [4] T. Nawaz, F. Poiesi and A. Cavallaro, "Measures of effective video tracking," *IEEE Trans. on Image Processing*, vol. 23, no. 1, pp. 376-388, Jan 2014

Acknowledgments

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