

Robust People Tracking using Global Trajectory Optimization

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Multi-People Tracking Challenges



- Thousands of frames
- Frequent occlusions
- Poor quality of input images
- Sudden illumination changes

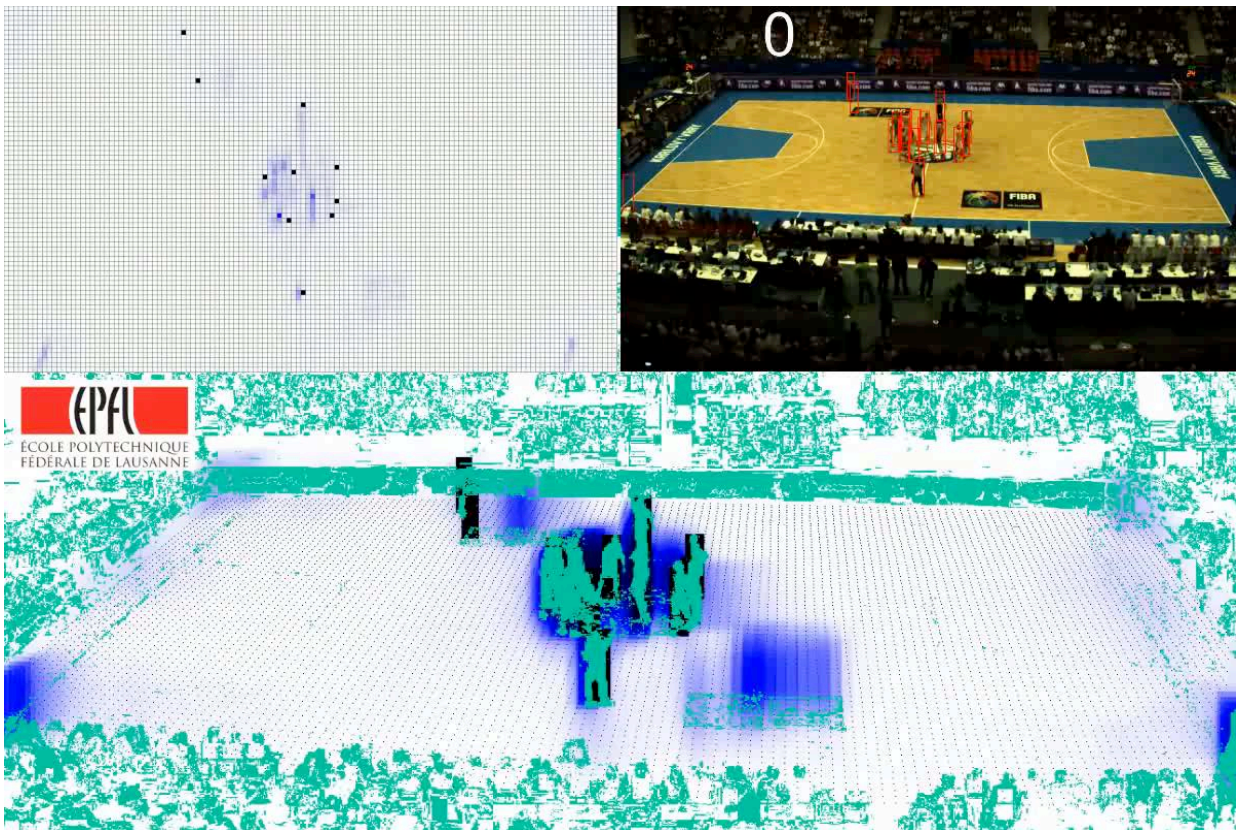
Multi-Step Algorithm



Given cameras with overlapping fields of view and a discretized ground plane.

- Estimate ground occupancy probabilities in individual temporal time frames.
- Enforce temporal consistency under very weak assumptions.
- Assign identity and/or behaviour.

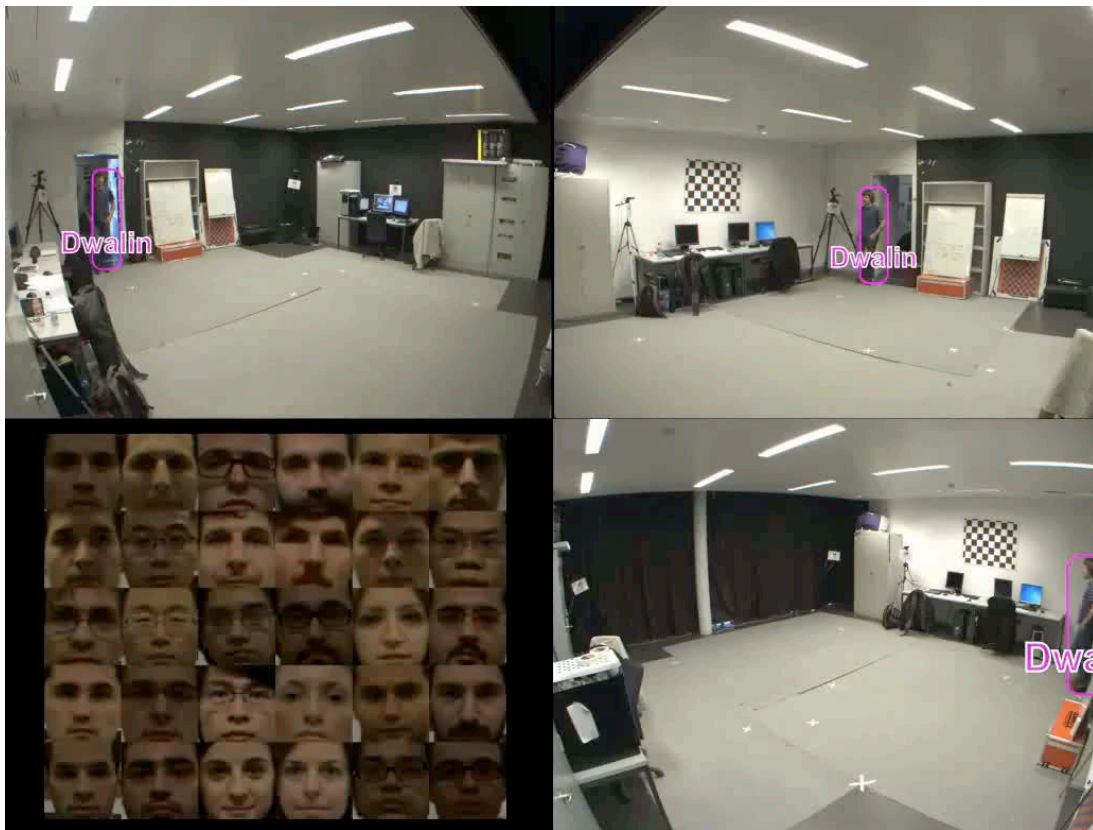
Many People Four Cameras



Basketball



Facial Identification



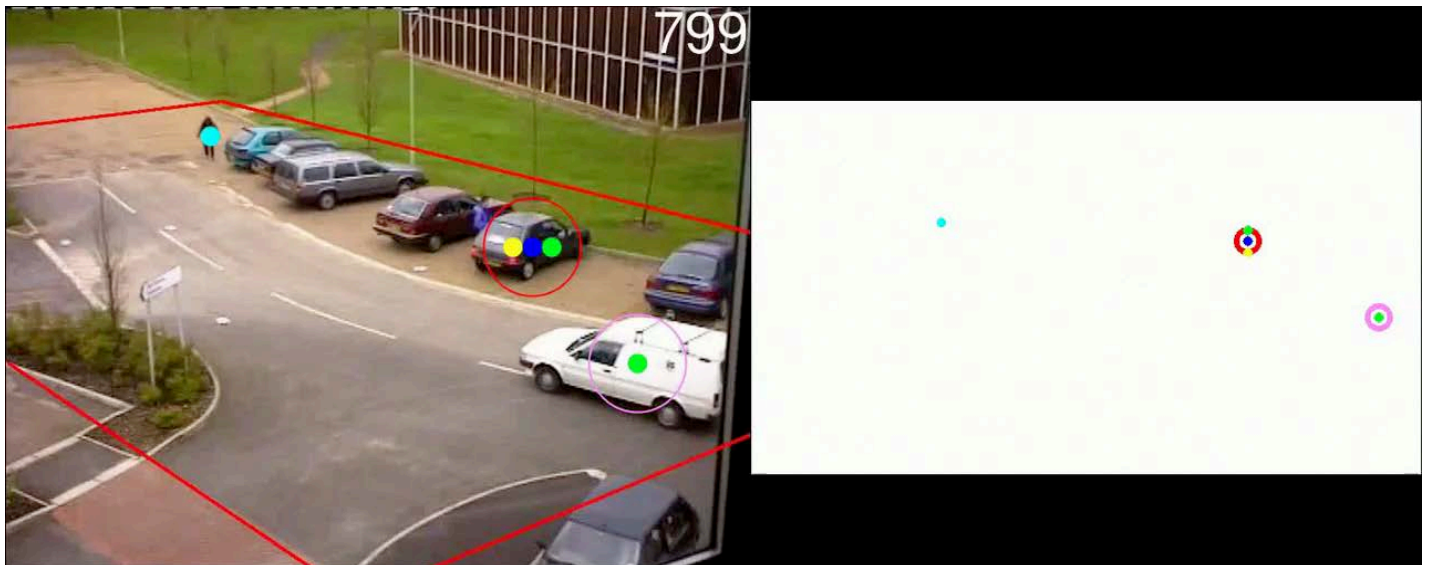
Facial Identification



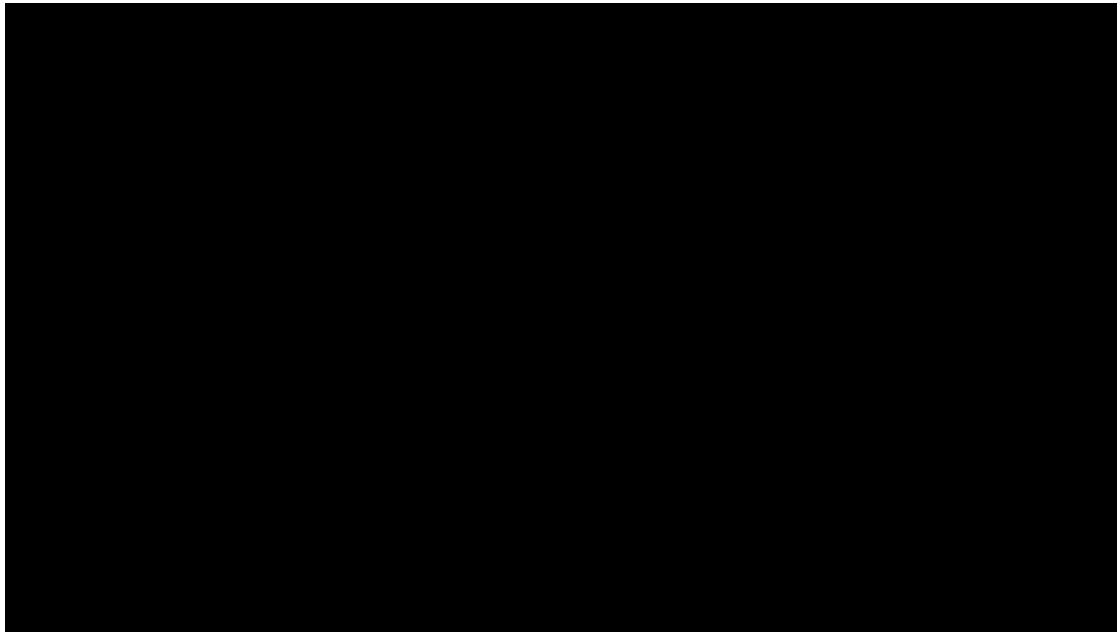
People and Objects



Making the invisible visible

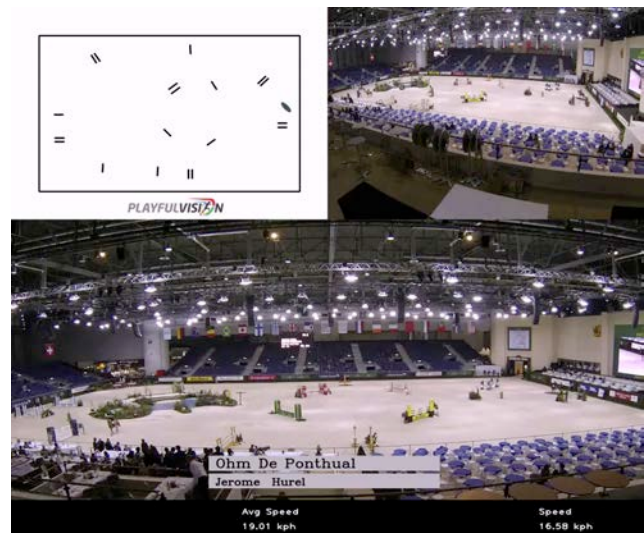


Tech Transfer



- PlayfulVision founded in 2014.
- Acquired by SecondSpectrum in 2015.

Tech Transfer



Conclusion

- Robust approach that can track arbitrary number of people over long periods of time.
- Does not require appearance information but can use it when available.
- Can handle the interaction between people and other moving objects.
- Real-time performance when using tracklets.

Future work

- Replace background subtraction by a people detector to handle higher crowd densities.
- Introduce more sophisticated templates to model different kinds of objects.
- Introduce behavioral models to further increase robustness and detect unusual behaviors.
- Infer full 3D poses using the 2D trajectories as priors.

References and Code

- F. Fleuret, J. Berclaz, R. Lengagne and P. Fua, **Multi-Camera People Tracking with a Probabilistic Occupancy Map**, PAMI 2008.
- J. Berclaz, F. Fleuret, E. Türetken and P. Fua, **Multiple Object Tracking using K-Shortest Paths**, PAMI 2011.
- H. Ben Shitrit, J. Berclaz, F. Fleuret, and P. Fua, **Multi-Commodity Network Flow for Tracking Multiple People**, PAMI 2014.
- X. Wang, E. Turetken, F. Fleuret, and P. Fua. **Tracking Interacting Objects Using Intertwined Flows**, *PAMI* 2016.
- Code can be downloaded from
 - <http://cvlab.epfl.ch/software/pom/index.php>
 - <http://cvlab.epfl.ch/software/ksp/index.php>