Crowd Scene Tracking

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REFERENCES

- [1] N. Courty and T. Corpetti, 'Crowd motion capture', Computer Animation and Virtual Worlds, vol. 18, no. 4-5, pp. 361-370, 2007.
- [2] B. Boghossian and S. Velastin, 'Image Processing System for Pedestrian Monitoring Using Neural Classification of Normal Motion Patterns', *Measurement and Control*, vol. 32, no. 9, pp. 261-264, 1999.
- [3] K. Lee, M. Choi, Q. Hong and J. Lee, 'Group Behavior from Video: A Data-Driven Approach to Crowd Simulation', Eurographics/ ACM SIGGRAPH Symposium on Computer Animation (2007), pp. 109-118, 2007
- [4] R. McDonnell, M. Larkin, S. Dobbyn, S. Collins and C. O'Sullivan, 'Clone attack! Perception of crowd variety', ACM Trans. Graph., vol. 27, no. 3, p. 1, 2008.
- [5] R. Mehran, A. Oyama and M. Shah, 'Abnormal Crowd Behavior Detection using Social Force Model', *Computer Vision and Pattern Recognition*, vol. 2009, pp. 935-942, 2009.
- [6] M. Rodriguez, I. Laptev, J. Sivic, and J. Audibert 'Density-aware person detection and tracking in crowds', *Computer Vision (ICCV)*, 2011 IEEE International Conference on, pp. 2423-2430. IEEE, 2011.
- [7] D. Zhang, Y. Lu, L. Hu and H. Peng, 'Multi-human Tracking in Crowds Based on Head Detection and Energy Optimization', *Information Technology J.*, vol. 12, no. 8, pp. 1579-1585, 2013.
- [8] I. Ali and M. Dailey, 'Multiple human tracking in high-density crowds', Image and Vision Computing, vol. 30, no. 12, pp. 966-977, 2012.
- [9] F. Zhao and J. Li, 'Pedestrian Motion Tracking and Crowd Abnormal Behavior Detection Based on Intelligent Video Surveillance', *Journal of Networks*, vol. 9, no. 10, 2014.
- [10] I. Ali and M. Dailey, 'Head Plane Estimation Improves Accuracy of Pedestrian Tracking in Dense Crowds', Control Automation Robotics and Vision (ICARCV), 2010 11th International Conference on. IEEE, 2010.

- [11] D. Forsyth, 'Object Detection with Discriminatively Trained Part-Based Models', Computer, vol. 47, no. 2, pp. 6-7, 2014.
- [12] S. Saxena, F. Brmond, M. Thonnat and R. Ma, 'Crowd Behavior Recognition for Video Surveillance', Advanced Concepts For Intelligent Vision Systems, vol. 9783540884576, p. 970, 2008.
- [13] R. Eshel and Y. Moses, 'Tracking in a Dense Crowd Using Multiple Cameras', Int J Comput Vis, vol. 88, no. 1, pp. 129-143, 2009.
- [14] A.B. Chan, Z.-S.J. Liang and N. Vasconcelos, 'Privacy preserving crowd monitoring: Counting people without people models or tracking', *Computer Vision and Pattern Recognition*, 2008. CVPR 2008. IEEE Conference on , pp.1,7, 23-28 June 2008
- [15] V.K. Singh, Bo Wu and R. Nevatia, 'Pedestrian Tracking by Associating Tracklets using Detection Residuals,' *Motion and video Computing*, 2008. WMVC 2008. IEEE Workshop on, pp.1,8, 8-9 Jan. 2008
- [16] M. Liem and D. Gavrila, 'Joint multi-person detection and tracking from overlapping cameras', Computer Vision and Image Understanding, vol. 128, pp. 36-50, 2014.
- [17] S. Ali and M. Shah, 'Floor Fields for Tracking in High Density Crowd Scenes', Computer Vision ECCV 2008, vol. 5303, pp. 1-14, 2008.
- [18] S. Pellegrini, A. Ess, K. Schindler and L. van Gool, 'Youll Never Walk Alone: Modeling Social Behavior for Multi-target Tracking', *Computer Vision*, 2009 IEEE 12th International Conference on, pp. 261 - 268, 2009.
- [19] A. Yilmaz, O. Javed and M. Shah, 'Object tracking', CSUR., vol. 38, no. 4, pp. 1-45, 2006.
- [20] M. Thida, Y. Leng Yong, P. Climent-Prez, H. Eng and P. Remagnino, 'A Literature Review on Video Analytics of Crowded Scenes', *Intelligent Multimedia Surveillance*, pp. 17-36, 2013.
- [21] R. Hartley and A. Zisserman, Multiple View Geometry, Cambridge University Publishers, 2nd ed. 2004
- [22] G. Shu, A. Dehghan, O. Oreifej, E. Hand and M. Shah, Part-based Multiple-Person Tracking with Partial Occlusion Handling, *Computer Vision and Pattern Recognition*, 2012 IEEE Conference on (pp. 1815-1821), 2012.
- [23] P. Viola and M. Jones, 'Rapid Object Detection using a Boosted Cascade of Simple Features Computer Vision and Pattern Recognition Proceedings', 2001 IEEE Computer Society Conference, vol. 1: I-511 I-518, 2001.