Lectures on Model-Based Visual Tracking

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Selected bibliographic references

Survey papers on visual tracking

- [1]
- [26]

Lecture 2. Camera-world geometry

Representation of rigid-body rotations

- [1] (§ 2.2) with references

Intrinsic camera parameters

- [1] (§ 2.1) with references
- The MATLAB Calibration Toolbox: http://www.vision.caltech.edu/bouguetj/calib_doc/

Lecture 3. 3D pose estimation from point correspondences

Linear and Nonlinear LSE (Gauss-Newton and Levenberg-Marquardt)

- [1] (§ 2.4) with references

Robust LSE (RANSAC and M-Estimators)

- [1] (§ 2.5) with references
- [2] (original paper on RANSAC)

P3P pose estimation problem:

- [1] (§ 2.3.3) with references

Lectures 4-5. Bayesian Tracking

Motion models (Brownian Motion, WNA)

- [3]

Bayesian tracking scheme

- [1] (§ 2.6) with references

Kalman Filter

- [1] (§ 2.6.1) with references
- http://www.cs.unc.edu/~welch/kalman/
- [3]

Extended Kalman Filter

- [1] (§ 2.6.1) with references
- [3]

Particle Filters

- [1] (§ 2.6.2.) with references
- [4]
- The Condensation web page:
  http://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL_COPIES/ISARD1/condensation.html

Lecture 6. Kanade-Lucas-Tomasi features tracker

KLT algorithm

- http://www.ces.clemson.edu/~stb/klt/
- [5]

Optical Flow

- http://en.wikipedia.org/wiki/Optical_flow

Harris Corner detector:

- http://en.wikipedia.org/wiki/Corner_detection
- [6]

Lecture 7. SIFT

- [7]
- [8]
- [9]

Lecture 8. Edge-based contour tracking

- [1] (§ 4.1) with references
- [10]
- [11]
- http://en.wikipedia.org/wiki/Canny
- [12]
- [13]

Lecture 9. Contour tracking using Likelihood functions

B-Splines

- http://de.wikipedia.org/wiki/Spline, and references
- http://userpage.fu-berlin.de/~vratisla/Bildverarbeitung/Bspline/Bspline.html

CONDENSATION for contour tracking

- Official Page: http://www.robots.ox.ac.uk/~misard/condensation.html
- [4]

CCD Algorithm

- [14]
- [15]

Lecture 10. Active Appearance Models

AAM Webpages:

- http://www2.imm.dtu.dk/~aam/tracking
- http://www2.imm.dtu.dk/~aam/faces
- Tim Cootes' page: http://www.isbe.man.ac.uk/~bim/
- CMU Webpage: http://www.ri.cmu.edu/projects/project_448.html

AAM Papers

- [16]
- [17]

PCA

- http://de.wikipedia.org/wiki/Principal_Component_Analysis

Lecture 11. Lucas-Kanade Algorithm for template matching

- http://www.ri.cmu.edu/projects/project_515.html (with Matlab code)
- [20]
- [16] (Piece-wise affine Warp)
- [16] (forwards- and inverse-compositional methods)
- [16] (combined pose+appearance optimization)
- [19]

Lecture 12. Robust Template Similarity Functions

- [18] (M-Estimators)
- [21] (NCC)
- http://en.wikipedia.org/wiki/Information_theory
- http://en.wikipedia.org/wiki/Mutual_information
- [22] (Shannon's original paper)
- [23]
- [24]
- [25] (Optimization of MI)

References

[1] V. Lepetit and P. Fua, Monocular Model-Based 3D Tracking of Rigid Objects: A Survey, Foundations and Trends in Computer Graphics and Vision, Vol. 1, Nr. 1, pp. 1-89, October 2005 Online : http://cvlab.epfl.ch/publications/publications/2005/LepetitF05.pdf

NOTE: This text contains also more references inside (some of them are included below).

[2] M. A. Fischler, R. C. Bolles. Random Sample Consensus: A Paradigm for Model Fitting with Applications to Image Analysis and Automated Cartography. Comm. of the ACM, Vol 24, pp 381-395, 1981

[3] Yaakov Bar-Shalom, X.-Rong Li, Thiagalingam Kirubarajan Estimation with Applications to Tracking and Navigation, 2002

[4] Michael Isard and Andrew Blake CONDENSATION -- conditional density propagation for visual tracking Int. J. Computer Vision, 29, 1, 5--28, (1998)

[5] Jianbo Shi and Carlo Tomasi. Good Features to Track. IEEE Conference on Computer Vision and Pattern Recognition, pages 593-600, 1994.

[6] C. Harris and M. Stephens (1988). "A combined corner and edge detector". *Proceedings of the 4th Alvey Vision Conference*, pages 147--151.

[7] Lowe, D. G., "Distinctive Image Features from Scale-Invariant Keypoints", International Journal of Computer Vision, 60, 2, pp. 91-110, 2004.

[8] Lindeberg, Tony "Feature detection with automatic scale selection", International Journal of Computer Vision, 30, 2, pp 77--116, 1998.

[9] Iryna Skrypnyk, David G. Lowe: Scene Modelling, Recognition and Tracking with Invariant Image Features. ISMAR 2004: 110-119

[10] C. J. Harris. Tracking with rigid models. In A. Blake and A. Yuille, editors, *Active Vision*. MIT Press, Cambridge, MA, 1992.

[11] J. Canny *A Computational Approach to Edge Detection*, IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol 8, No. 6, Nov 1986.

[12] David G. Lowe: Three-Dimensional Object Recognition from Single Two-Dimensional Images. Artif. Intell. 31(3): 355-395 (1987)

[13] Model-Based Object Tracking in Monocular Image Sequences of Road Traffic Scenes. D. Koller, K. Daniilidis, H.-H. Nagel. International Journal of Computer Vision 10:3 (1993) 257--281.

[14] Robert Hanek and Michael Beetz. The Contracting Curve Density Algorithm: Fitting Parametric Curve Models to Images Using Local Self-adapting Separation Criteria. *International Journal of Computer Vision (IJCV)*, 59(3):233–258, 2004.

[15] Robert Hanek, Thorsten Schmitt, Sebastian Buck, Michael Beetz: Towards RoboCup without Color Labeling. RoboCup 2002: 179-194

[16] T.F.Cootes, G.J. Edwards and C.J.Taylor. "Active Appearance Models", in Proc. European Conference on Computer Vision 1998 (H.Burkhardt & B. Neumann Ed.s). Vol. 2, pp. 484-498, Springer, 1998.

[17] I. Matthews and S. Baker "Active Appearance Models Revisited", International Journal of Computer Vision, Vol. 60, No. 2, November, 2004, pp. 135 - 164.

[18] B. Theobald, I. Matthews, and S. Baker, "Evaluating Error Functions for Robust Active Appearance Models", Proceedings of the International Conference on Automatic Face and Gesture Recognition, April, 2006, pp. 149 - 154.

[19] J. Xiao, S. Baker, I. Matthews, and T. Kanade, "Real-Time Combined 2D+3D Active Appearance Models", Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, June, 2004.

[20] S. Baker and I. Matthews, "Lucas-Kanade 20 Years On: A Unifying Framework", International Journal of Computer Vision, Vol. 56, No. 3, March, 2004, pp. 221 - 255.

[21] J. P. Lewis, "Fast Template Matching", Vision Interface, p. 120-123, 1995.

[22] Claude E. Shannon "A Mathematical Theory of Communication", Bell System Technical Journal, Vol. 27, pp. 379–423, 623–656, 1948.

[23] P Viola, WM Wells III "Alignment by Maximization of Mutual Information", International Journal of Computer Vision, 1997 – Springer

[24] Frederik Maes, André Collignon, Dirk Vandermeulen, Guy Marchal, Paul Suetens: "Multimodality Image Registration by Maximization of Mutual Information" IEEE Trans. Med. Imaging 16(2): 187-198 (1997)

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