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Effects of rotation and systematic occlusion on fiducial marker recognition

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Abstract

© 2017 The Authors. Fiducial marker systems consist of patterns that are placed in environment for miscellaneous applications and are further automatically detected with cameras. A variety of applications determines the criteria, which characterize qualitative properties of a marker and include such evaluation benchmarks as resilience to occlusion, distance to a marker, false positive and false negative rates, sensitivity to illumination, and others. The paper compares existing ARTag, AprilTag, and CALTag systems utilizing a high fidelity camera, which is a main vision sensor of a full-size Russian humanoid robot AR-601M. In experiments the comparison of the three marker systems reliability and detection rate in occlusions of various types and intensities was verified. Finally, a preferable for AR-601M robot visual applications marker system was selected.

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References

[1] A. Klimchik, E. Magid, and A. Pashkevich, IFAC Conf. on Manufacturing Modelling, Management and Control, Elsevier Ltd., 49 (12), 967-972 (2016)

[2] R. Khusainov, I. Shimchik, I. Afanasyev, and E. Magid, Int. Conf. on Informatics in Control, Automation and Robotics, 2, 141-148 (2015)

[3] A. Buyval, I. Afanasyev, E. Magid, Int. Conf. on Machine Vision, 141-148 (2016)

[4] E. Magid, T. Tsubouchi, Lecture Notes in Artificial Intelligence, 6472, 423-435 (2010)

[5] M. Hirzer, Seminar/Project Image Analysis Graz, 1-25 (2008)

[6] M. Fiala, IEEE Int. Workshop on Haptic Audio Visual Environments and their Applications, 148-153 (2005)

[7] M. Fiala, IEEE Computer Society Conf. on Computer Vision and Pattern Recognition, 2, 590-596 (2005)

[8] A. Sagitov, K. Shabalina, E. Magid, Int. Conf. on Mechanical, System and Control Engineering, Saint-Petersburg, Russia, (2017,. to be published)

[9] K. Shabalina, A. Sagitov, E. Magid, H. Li, 10-th Int. Conf. on Developments in eSystems Engineering, France, (2017, to appear)

[10] H. Kato, M. Billinghurst. IEEE and ACM Int. Workshop on Augmented Reality, 85-94 (1999)

[11] M. Fiala, National Research Council Publication, 47419, 1-47 (2004)

[12] E. Olson, IEEE Int. Conf. on Robotics and Automation, 3400-3407 (2011)

[13] A. Trachtenbert, Computational methods in coding theory. MS thesis. University of Illinois at Urbana-Champaign, (1996)

[14] B. Atcheson, F. Heide, W. Heidrich, Vision, Modeling, and Visualization Workshop, 10, 41-48 (2010)

[15] S. Garrido-Jurado, R. Munõz-Salinas, F.J. Madrid-Cuevas, M.J. Marín-Jiménez, Pattern Recognition, 47 (6), 2280-2292 (2014)