Czech Technical University in Prague
Faculty of Electrical Engineering

Department of Cybernetics

BACHELOR PROJECT ASSIGNMENT

Student: Oleh R y b k i n

Study programme: Open Informatics

Specialisation: Computer and Information Science

Title of Bachelor Project: Robust Focal Length Computation

Guidelines:

1. Review the state of the art in camera focal length computation from Fundamental matrices in [1-8] and in references therein.
2. Experiment with the standard approach to focal length computation [1,2] and describe its limitations.
3. Suggest an improvement of the focal length calibration and implement it in Matlab.
4. Provide experimental evaluation of the new method and comparison to the state of the art focal length computation.

Bibliography/Sources:

[1] Hartley, R., Zisserman, A.: Multiple View Geometry in Computer Vision, Cambridge University Press, 2nd ed.,2003.
[2] Bougnoux, S.: From Projective to Euclidean space under any practical situation, a criticism of self-calibration. In Proc. 6th International Conference on Computer Vision, Bombay, India, pages 790-796, January 1998.
[3] Kanatani, K., Matsunaga, C.: Closed-form expression for focal lengths from the fundamental matrix. Proc. Asian Conference on Computer Vision, vol. 1, pp. 128-133, 2000.
[4] Kanatani, K., Nakatsuji, A., Sugaya, Y.: Stabilizing the focal length computation for 3D reconstruction from two uncalibrated views. The International Journal of Computer Vision, 66(2), pp. 109-122, 2006.
[5] Sturm, P.: On focal length calibration from two views. Proc. IEEE International Conference on Computer Vision and Pattern Recognition, pp. 145-150, 2001.
[6] Sturm, P., Cheng, Z.L., Chen, P.C.Y., Poo, A.N.: Focal length calibration from two views: method and analysis of singular cases. Computer Vision and Image Understanding, 99(1), pp. 58-95, 2005.
[7] Stewénius, H. et al.: "A Minimal Solution for Relative Pose with Unknown Focal Length". In: Computer Vision and Pattern Recognition. 2005.
[8] Kukelova, Z.: PhD Thesis "Algebraic Methods in Computer Vision". Thesis Advisor: Tomas Pajdla. Center for Machine Perception. Dept. of Cybernetics. FEE, CTU in Prague, 2013.

Bachelor Project Supervisor: Ing. Tomáš Pajdla, Ph.D.

Valid until: the end of the summer semester of academic year 2017/2018

L.S.

prof. Dr. Ing. Jan Kybic
Head of Department

prof. Ing. Pavel Ripka, CSc.
Dean

Prague, January 6, 2017