

I. Personal and study details

Student's name: **Lučivňák Pavel** Personal ID number: **435627**
Faculty / Institute: **Faculty of Electrical Engineering**
Department / Institute: **Department of Computer Science**
Study program: **Open Informatics**
Specialisation: **Artificial Intelligence**

II. Master's thesis details

Master's thesis title in English:

Visual Localization with HoloLens

Master's thesis title in Czech:

Vizuální lokalizace pro HoloLens

Guidelines:

- 1) Review the state of the art in indoor visual localization, see [1,2] and references therein.
- 2) Adjust method [2] to local environment and image acquisition using HoloLens. Create new 3D data set for the local environment and evaluate the accuracy of the localization w.r.t. a ground truth in that environment.
- 3) Apply InLoc localization method on data from HoloLens, evaluate behavior and inaccuracies of the localization on this data. Investigate a possibility of using multiple images for improving the localization.
- 4) Demonstrate and evaluate the improved method for HoloLens localization.

Bibliography / sources:

- [1] Arandjelović, R.; Gronat, P.; et al. NetVLAD: CNN architecture for weakly supervised place recognition. In IEEE Conference on Computer Vision and Pattern Recognition, 2016.
- [2] Taira, H.; Okutomi, M.; et al. InLoc: Indoor Visual Localization with Dense Matching and View Synthesis. In 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition, June 2018, ISSN 1063-6919, pp. 7199–7209, doi:10.1109/CVPR.2018.00752.
- [3] Garg, R.; Kumar, B. V.; et al. Unsupervised CNN for single view depth estimation: Geometry to the rescue. In European Conference on Computer Vision, Springer, 2016, pp. 740–756.
- [4] Zhang, Y.; Funkhouser, T. Deep Depth Completion of a Single RGB-D Image. The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018.
- [5] Van Gansbeke, W.; Neven, D.; et al. Sparse and Noisy LiDAR Completion with RGB Guidance and Uncertainty. In 2019 16th International Conference on Machine Vision Applications (MVA), IEEE, 2019, pp. 1–6.

Name and workplace of master's thesis supervisor:

doc. Ing. Tomáš Pajdla, Ph.D., Applied Algebra and Geometry, CIIRC

Name and workplace of second master's thesis supervisor or consultant:

Date of master's thesis assignment: **04.02.2020** Deadline for master's thesis submission: **14.08.2020**

Assignment valid until: **30.09.2021**

doc. Ing. Tomáš Pajdla, Ph.D.
Supervisor's signature

Head of department's signature

prof. Mgr. Petr Páta, Ph.D.
Dean's signature

III. Assignment receipt

The student acknowledges that the master's thesis is an individual work. The student must produce his thesis without the assistance of others, with the exception of provided consultations. Within the master's thesis, the author must state the names of consultants and include a list of references.

Date of assignment receipt

Student's signature