MASTER'S THESIS ASSIGNMENT

I. Personal and study details

Student's name: **Jašek Otakar** Personal ID number: **420148**

Faculty / Institute: **Faculty of Electrical Engineering**

Department / Institute: **Department of Cybernetics**

Study program: **Open Informatics**

Branch of study: **Computer Vision and Image Processing**

II. Master's thesis details

Master's thesis title in English:

Simulating Depth Measuring Sensors for Autonomous Learning and Benchmarking

Master's thesis title in Czech:

Simulace hloubkových senzorů pro autonomní učení a testování

Guidelines:

Accurate perception is an essential component for many fundamental capabilities such as emergency braking, predictive control for active damping, safe turning on a road intersection or self-localization from offline maps. Consequently, any fully-autonomous vehicle requires an algorithm which process low-level data such as RGBD measurements and provides a high-level interpretation of the actual situation, such as positions of pedestrians and cars in the close neighbourhood of the expected vehicle trajectory. State-of-the-art approaches such as supervised learning of deep convolutional neural networks has started to achieve super-human level, however millions of annotated training data are required for both learning and validation. Collecting and annotating real world data for is extremely demanding. On the other hand, pure physical simulation of RGBD sensors has not yet achieved sufficient level of maturity, despite of increasingly growing game industry. We propose to simulate realistic sensor measurements by introducing not-easy-to-model systematic failures "noise" learned from real captured data.

1. Familiarize yourself with Valeo data-interface and create the calibrated dataset with RGBD images and corresponding annotations.
2. Study state-of-the-art methods for Generative Adversarial Networks such as [1,2,3] and try available implementations [4].
3. Propose a method for data-driven simulation of a depth sensor. Optionally, extend proposed method for an RGBD sensor.
4. Evaluate proposed method and discuss typical failure cases.

Bibliography / sources:

[1] I. J. Goodfellow, J. Pouget-Abadie, M. Mirza, B. Xu, D. Warde-Farley, S. Ozair, A. Courville, and Y. Bengio, Generative Adversarial Nets. Proceedings Neural Information Processing Systems Conference, 2014
[2] P. Isola, J.-Y. Zhu, T. Zhou, and A. A. Efros, Image-to-Image Translation with Conditional Adversarial Networks. ArXiv, 2016. https://arxiv.org/pdf/1611.07004v1.pdf
[3] Ashish Shrivastava, Tomas Pfister, Oncel Tuzel, Josh Susskind, Wenda Wang, Russ Webb, Learning from Simulated and Unsupervised Images through Adversarial Training, CVPR 2017 best paper award.
https://github.com/zhangqianhui/AdversarialNetsPapers
[4] https://github.com/zhangqianhui/AdversarialNetsPapers

Name and workplace of master's thesis supervisor:

doc. Ing. Karel Zimmermann, Ph.D., Vision for Robotics and Autonomous Systems, FEE

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

Date of master's thesis assignment: **08.01.2018** Deadline for master's thesis submission: **25.05.2018**

Assignment valid until: **30.09.2019**

doc. Ing. Karel Zimmermann, Ph.D. Supervisor's signature	doc. Ing. Tomáš Svoboda, Ph.D. Head of department's signature	prof. Ing. Pavel Ripka, CSc. 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