FACULTY
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CTU IN PRAGUE

Assignment of master's thesis

Title:	Estimation of detection probability in multitarget filters using object advanced image processing techniques
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Study program:	Informatics
Branch / specialization:	Knowledge Engineering
Department:	Department of Applied Mathematics
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Instructions

Abstract: The subject of the thesis is the dynamic adjustment of the detection probability in random finite set (RFS)-based filters. These filters can track objects in noisy environments from imprecise measurements. However, they rely on the knowledge of the object (mis)detection probability. If this quantity is set inappropriately, the filters are oversensitive and prone to track loss. However, there is no convenient methodology for a consistent estimation of the detection probability. The present thesis aims to focus on its inference using algorithms for object detection and image segmentation. For object detection, the YOLO model should be used, for segmentation, the Segment anything from Meta AI is a possible way towards a solution. These models can recognize various objects in the image. It is conjectured that the combination of these algorithms can yield a filter with good robustness to target misdetections.

The goals are as follows:
- study the principles of the multitarget tracking algorithms
- study the principles of image segmentation and object detection
- propose a technique for estimation of object detection probability
- perform assessment of the proposed algorithm and discuss the obtained results

Literature:
[1] A. F. Garcia-Fernandez, A. S. Rahmathullah, and L. Svensson, "A Metric on the Space of Finite Sets of Trajectories for Evaluation of Multi-Target Tracking Algorithms," IEEE Trans.

Electronically approved by Ing. Magda Friedjungová, Ph.D. on 31 January 2024 in Prague.

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[3] B. N. Vo and W. K. Ma, "The Gaussian mixture probability hypothesis density filter," IEEE Transactions on Signal Processing, vol. 54, no. 11, pp. 4091–4104, 2006, doi: 10.1109/TSP.2006.881190.
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