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Let machines do the work!

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Within the last decade the performance of spatial data acquisition devices has increased to a level where, in a split second, several gigabytes of observation data can be acquired at once. With the increased performance of sensors, processing time and complexity of large amounts of data have increased as well. The employment of the human work force for data processing and analysis is expensive, and has limited capabilities. To transform data to information, automation procedures for segmentation, labeling and interpretation of acquired data are necessary to support human decision makers in generalization and information classification. Recent progress in machine learning, especially convolutional neural networks, the window of opportunity has been opened for assisting systems: They have chance to become more reliable and robust without additional implementation efforts. These new assisting systems are able to perform tasks which were reserved for trained human labor. Following two use cases should be considered: a) an intelligent and autonomous catheter, guided by highly accurate and reliable sensor-actor control system should be able to perform TAVI operations on a patient. b) An autonomous robot equipped with 3-D and multispectral sensing performs weed detection and treatment 24/7 without significant human assistance. These systems have great potential as products, though there are still various hurdles to be taken. Apparently, the state-of-the art deep learning methods can solve many of the challenges: They are able to crunch a large amount of data, extract useful information, and make decisions autonomously. At present these methods rely on very large amount of data that is required for their training. The crucial question is: Is there an efficient solution to improve the performance of intelligent systems with more accurate and reliable sensors? Reducing the noise in the measurements enables more efficient and precise modelling of the data, thus shorter training process. Is it that simple? Two use cases mentioned above were major goals in several successful research projects, their results allow interesting discussion.

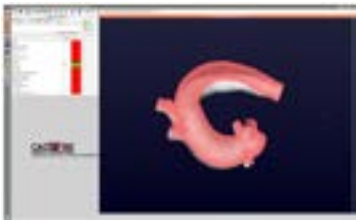

Figure 1: Project CASCADE: Deformed vessel (red) superposed to the original (gray) allows surgeon (operator) to observe the effect of catheter and pulse on the vessel shape in real-time

Recent Publications

1. Vander Poorten E, Tran P, Devreker A, Rosa B, Gruijthuijsen C, Portoles-Diez S, Smoljkic G, Strbac V, Famaey N, Reynaerts D, Vander Sloten J, Tibebu A, Yu B, Rauch C, Bernard F, H Metzen J, Giannarou S, Zhao L, Lee S L, Stoyanov D, Mazomenos E, Chang P, Kvasnytsia M, Van Deun J, Verhoelst E, Settef M, Di Iasio A, Leo G, Hertner F, Scherly D, Chelini L, Häni N, Šeatović D, De Praetere H and Herijgers P (2016) Cognitive autonomous catheters operating in dynamic environments. Journal of Medical Robotics Research (3):1-25.

2. Cool S, Pieters J G, Seatovic D, Mertens K C, Nuyttens D R E, Van De Gucht T C and Vangeyt J (2017) Development of a stereovision based technique to measure spread patterns of granular fertilizer spreaders, MDPI Journal: Sensors: Special Issue: Sensors in Agriculture and Forestry, ISSN 1424-8220.

Biography

Dejan Šeatović is an experienced Engineer and Scientist with strong focus on intelligent systems. Has led in numerous industrial and research projects which have shaped his competences in areas of software engineering, mechatronics, remote sensing, ranging and computer vision. His mission is to understand the end-user requirements and wishes in order to steer the research and development towards usable and reliable intelligent systems. His professional career started at Leica Geosystems AG, Switzerland and continued in the academic environment, where he is at present and effectively connects both worlds.

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