Advisor’s review for the doctoral thesis

Jan Blažek

Multimodal Image Processing in Art Investigation

Mgr. Jan Blažek has been with the Dept. of Image Processing since 2008 when he started to work on his Master thesis under my guidance. From the beginning, he was oriented on applications of image processing in the area of art investigation, both theoretically and practically, doing various measurements and data acquisitions. His direction of research is strongly interdisciplinary. In 2012-2014 he was an active participant in GAČR grant no. GAP103/12/2211, called “Methods for multimodal image processing based on mathematical models of optical properties of paint materials for artwork analysis”. In 2015 he initiated new cooperation with University of Florence, which resulted in several papers and it lasts until today. He guided several Bachelor and Master student at MFF UK (7).

From the beginning of his Ph.D. studies, Jan Blažek has been focused on processes related to data acquisition and their further analysis. Recent advances in image acquisition hardware make it possible to collect data in different modalities. However, their understanding and existence of appropriate analysis and visualization methods are crucial.

Most of Jan’s work is related either to efficient data acquisition or to their preprocessing to increase their comprehensibility. His first works are about preprocessing such as geometrical alignment and degradation removal (artifact removal), then he started to be interested in change detection and difference visualization to capture painting author’s intentions. Along the way he understood importance and problems related to high-quality multimodal data, so his next research was oriented on developing fourteen-band light source based on LEDs, offering the possibility of mobile multispectral data acquisition. At the same time, he participated in the creation of a publicly available database of paint materials, where properties of paint materials can be studied together with underdrawings behavior. Database study led to deeper understanding of paint material analysis and problems with the interpretation of acquired data. His last result fuses the material analysis with the visualization aim when concealed features of a painting are estimated and thus underdrawings can be better comprehended. Next to the included papers, his thesis contains a detailed survey of existing problems and approaches with many insights from the area of art analysis and image processing. This text is now under preparation for the journal publication.

His contributions are tightly related to the interdisciplinary research which uses image processing methods for art investigation; this is the main topic of his paper collection. At the same time methods developer for change detection or for concealed features visualization can be used for another type of image data. The latter approach was used for example for datasets coming from remote sensing research, so the applicability is wider than the art analysis.

His scientific work has already attracted international attention. The most interesting papers for the scientific community are the ones related to data fusion (year: # citations: an author’s share; 2009:8:75%, 2011:5:40%) and to the data acquisition device (2013:5:60%).
His Spectrochimica Acta paper attracted 8 citations since 2015, but here his role was mainly as the data collector and analyst. The last article about concealed features has already got 1 citation even that it was published in 2017 (2017:1:90%).

Jan Blažek proved to be able to work independently and reliably, with deep insight into many areas of research. He is able to work independently, to set new scientific directions and start new international cooperation. His ideas and hypotheses reflect his broad overview of existing methodologies. He pays attention to validation and thoughtful planning of his work. During his study, Jan confirmed that he is highly motivated and able to set his research path. He proved the qualification for creative research work.

I recommend the thesis of Jan Blazek for the defense.

doc. RNDr. Barbara Zitová, PhD

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