Deutscher Mustererkennungspreis 2013

Laudatio for Dr. **Thomas Pock**

In the last two decades, optimization models have become omnipresent in image processing and computer vision. They are used e.g. for image denoising, deconvolution, segmentation, for computing the optic flow in image sequences, for stereo reconstruction, and for scene flow computation.

One important class of optimization models is based on variational formulations where non-differentiable energies are minimized. For instance, the famous total variation regularizers of Rudin, Osher and Fatemi give rise to such formulations. Unfortunately, classical strategies such as solving the Euler- Lagrange equations or using gradient descent methods become problematic in such non-differentiable scenarios: They have to struggle with singularities and suffer from slow convergence. Thus, there is a need for more powerful optimization methods that are also highly efficient. Ideally they should also exploit the potential of modern parallel hardware such as GPUs. This is the starting point for the research of Thomas Pock.

Thomas Pock has made fundamental contributions in the field of variational methods for image processing and computer vision. His contributions cover theoretical aspects as well as highly efficient algorithms for parallel hardware. In particular he was among the first researchers to demonstrate real- time performance of variational approaches implemented on graphics hardware. His work significantly contributed to the popularity of variational approaches in the community. Furthermore, his work on functional lifting allowed for the first time the computation of high-quality minimizers of difficult non-convex variational problems such as stereo, the celebrated Mumford-Shah model and the Potts model. One of the key contributions of Thomas Pock and his co-workers was the development of a very efficient first-order primal-dual algorithm for solving a class of structured convex optimization problems. The algorithm comes along with provable optimal convergence rates and can be highly accelerated on parallel hardware.

The impact of the research of Thomas Pock is documented both in academia and in industry. His DAGM 2007 paper on efficient TV-L1 optic flow computation is one of the most successful DAGM papers so far. The corresponding algorithm has entered real-time applications such as driver assistant systems. The before mentioned primal-dual algorithm for convex optimization problems appeared in 2011 in the Journal of Mathematical Imaging and Vision. Only two years after its publication, it is fair to say that it has become a classical algorithm in its field and it has already found its way into several textbooks.

Thomas Pock is not only an excellent and influential researcher, he is also a very active DAGM member. This is demonstrated e.g. by the fact that he was one of the organizers of last years DAGM-ÖAGM Conference. Thus, it is a double pleasure for the award committee and in particular also me to award the German Pattern Recognition Prize to him.

Please join me to welcome Thomas Pock for his award lecture.