

Parameter estimation in image processing - computing motion from image sequences

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Parameter estimation plays a dominant role in a large number of image processing and computer vision tasks. Parameters in these settings can be as diverse as the application areas. Examples of such parameters are the entries of filter kernels optimized for a certain criterium, image features such as the velocity field, or whole objects or compositions thereof. Subsequently, approaches for estimating these parameters encompass a wide range of techniques, often tuned to the application, the underlying data and viable assumptions.

Here, an overview of parameter estimation in image processing will be given. We will focus on the computation of motion from image sequences. In this area, a range of approaches is applied to tackle the underlying inverse problem. These approaches can also be applied to other areas of image processing. Besides outlining the models commonly used to constrain the problem, we will also present extensions and algorithmic concepts.

In addition to discussing the problem of estimating motion parameters from image sequences, we will also focus on the application of measuring fluid flow from imaging techniques in hydrodynamical problems. Here, additional information and physical constraint equations are available. Extending commonly used image processing approaches to include these constraints leads to physically correct and highly accurate estimates. Moreover, such constraint problems open up a wide range of mathematical questions.