

## Assignment C5 – Classroom Work

### Problem 1 (Optic Flow with Higher-Order Regularisation)

Write down a quadratic optic flow functional that incorporates constancy of the Laplacian of the image brightness as well as smoothness of the Laplacian of the flow field.

Compute the Euler-Lagrange equations.

*(Higher-order regularisation may lead to smoother flow fields. This is similar to the smoother interpolation results shown in Lecture 15.)*

### Problem 2 (Range Flow)

Assume you have a sequence of three-dimensional images and you want to compute the displacement field between subsequent frames.

Write down a corresponding energy functional that extends the method of Horn and Schunck (brightness constancy, quadratic regulariser) to this 3-D setting.

*(Such so-called range-flow techniques play an important role in biomedical imaging, e.g. in 3-D ultrasound imaging of the human heart, but also in bioinformatics when cell structures are to be tracked.)*