# Variational Methods for Computer Vision: Exercise Sheet 8

Exercise: 18 December 2014

## Part I: Theory

The following exercises should be **solved at home**. You do not have to hand in your solutions, however, writing it down will help you present your answer during the tutorials.

1. In the lecture the piecewise constant Mumford-Shah functional is given as the following:

$$E(\{u_1, \ldots, u_n\}, C) = \sum_{i=1}^{n} \int_{\Omega_i} (I(x) - u_i)^2 \, dx + \nu |C|$$

   Prove that by merging two regions $\Omega_1$ and $\Omega_2$ the energy $E$ changes by :

$$\delta E = \frac{A_1 A_2}{A_1 + A_2} (u_1 - u_2)^2 - \nu \delta C$$

   Where $A_i$ denotes the area of the regions in pixels, $u_i$ the respective mean values and $\delta C$ the length of the interface of both regions.

## Part II: Practical Exercises

This exercise is to be solved **during the tutorial**.

1. No practical exercise this week. Finish implementing the previous practical exercises.