

Abstract

The aim of this Thesis is to present an image partition and video segmentation procedure, based on the minimization of a modified version of Mumford-Shah functional.

The Mumford-Shah functional used for image partition has been then extended to develop a video segmentation procedure. Differently by the image processing, in video analysis besides the usual spatial connectivity of pixels (or regions) on each single frame, we have a natural notion of “*temporal*” connectivity between pixels (or regions) on consecutive frames given by the optical flow. In this case, it makes sense to extend the tree data structure used to model a single image with a graph data structure that allows to handle a video sequence.

The video segmentation procedure is based on minimization of a modified version of a Mumford-Shah functional. In particular the functional used for image partition allows to merge neighboring regions with similar color without considering their movement. Our idea has been to merge neighboring regions with similar color and similar optical flow vector. Also in this case the minimization of Mumford-Shah functional can be very complex if we consider each possible combination of the graph nodes. This computation becomes easy to do if we take into account a hierarchy of partitions constructed starting by the nodes of the graph.