A Priori Shape Information in Image Segmentation

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Prior knowledge is an essential component of the human vision system, allowing us to be more selective and effective in a visual recognition task. In computer vision, this need for including prior knowledge about the task to be realised is increasingly recognised. In this talk, we will show how shape information can be considered in a computer vision problem. Active contours, and especially geodesic active contours, provide an efficient formalism for including this kind of information in the segmentation process. We will show two approaches to tackle this. The first one uses an image template, described by an analytical decomposition using Matching Pursuit, to represent the typical object to be segmented. A multi-scale affine invariant decomposition of the target image using the template decomposition as a model allows to drive geodesic active contours towards the objects with the desired shape. In a second approach, the shape information is directly included in the evolution equations of a geodesic active contour. In this approach, the shape information is represented by a statistical representation (e.g a PCA) of example objects, described by their Signed Distance Functions, in a level set formalism. Examples on synthetic and real images will be shown.