# An Adaptive Grid Segmentation Algorithm for Mountain Silhouette Extraction from Images

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Modern image sharing platforms such as instagram or flickr support an easy publication of photos to the internet, thus leading to great numbers of available photos. However, many of these images are not properly tagged so that there is no notion of what they are showing. For the example of mountain recognition, it is advisable to create reference silhouettes from digital elevation maps. Those are matched with the silhouette extracted from a given image in order to recognise the mountain. It is therefore necessary to obtain a very precise silhouette from the query image.

Our method utilises an adaptive grid segmentation algorithm that extracts the silhouette from a query image. This approach first overlays the image with a grid, with defined grid element spacing, and calculates, through a classification step, for every grid point a score for the probability to belong to the sky segment of the image. Afterwards, the algorithm segments the image with a seed growing algorithm, starting at the grid points with the highest score, which are additionally connected to an high score point in the top row of the image, due to the assumption, that the sky will be localised in the upper part of the image. Having the image binary segmented the algorithm extracts the transition between the two segments as initial silhouette.

The silhouette extracted by this approach may, however, include outliers that are either artefacts, for example as result of segmentation errors, or obstacles like trees in front of the mountain's silhouette. Our approach tries to find these outliers during an outlier detection step and afterwards to classify those into the mentioned classes. If an obstacle is detected, it is removed from the silhouette by replacing it by a straight. If an artefact is detected this gets reported to the segmentation step of our algorithm. There, with changed parameters, for the grid points located around the artefact, for edge detection, we try to find a better segmentation for the part of the silhouette the outlier appeared in. These steps are repeated until we end with a silhouette free of outliers and obstacles.

First experiments show that we reach a median average deviation of 1.51 pixels to the reference silhouettes. Hereby, we measure the deviation of each pixel of one silhouette extracted by our approach to the corresponding pixel of the reference silhouette.