Dictionary based image segmentation

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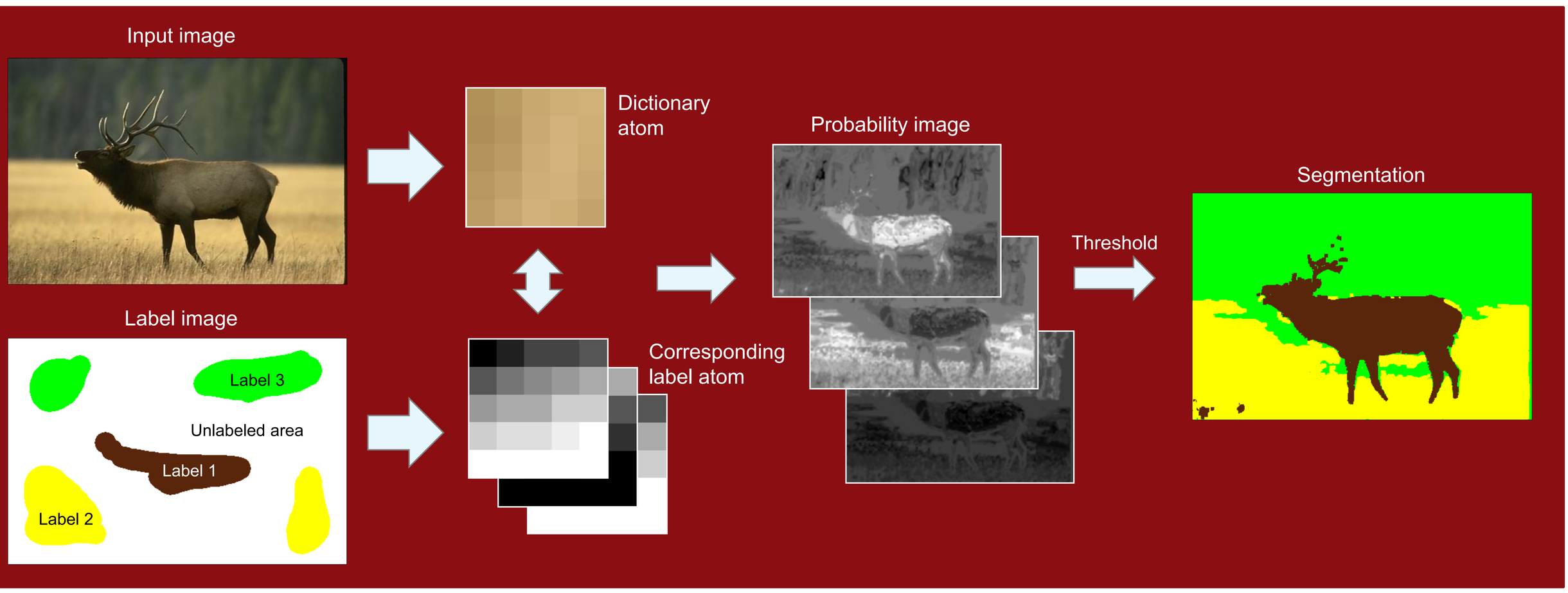
Introduction

Image segmentation using dictionaries of image patches has been shown to provide good results (Dahl and Larsen, BMVC 2011). However, it requires time consuming manual image annotation. The aim of this project is to investigate three different modifications of this method which require less annotation time.

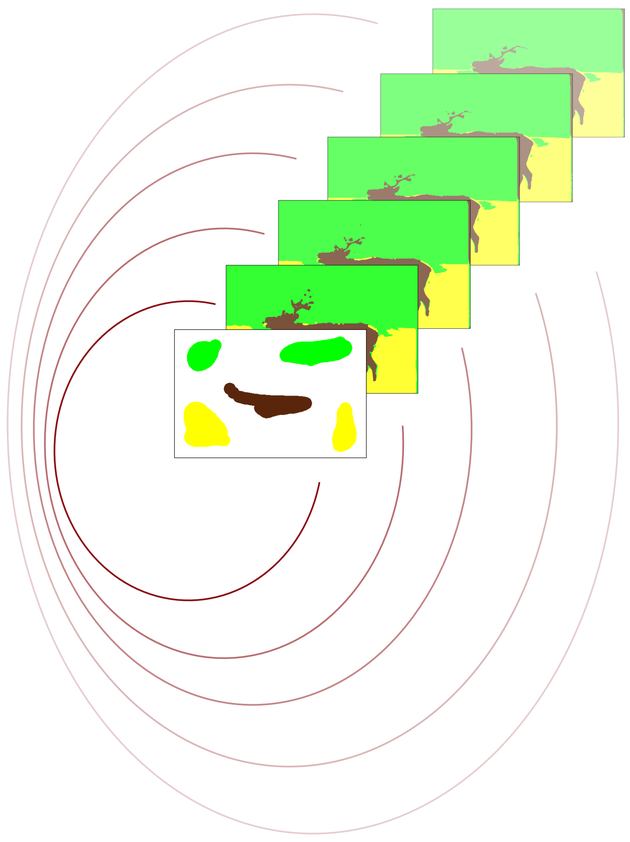
Method

The segmentation is based on a dictionary of image patches, denoted dictionary atoms, with corresponding label atoms. These label atoms are obtained from the user annotation of the input image. The output of the method is a segmentation where each pixel is assigned to a certain class label. When using the original method, all pixels in the input image have to be assigned to a class label. In the three modifications unlabelled areas are allowed. Unlabelled pixels are assigned an equal probability of belonging to each class. For the first iteration a partial annotation is used as the label image. For the next iterations different strategies can be applied.



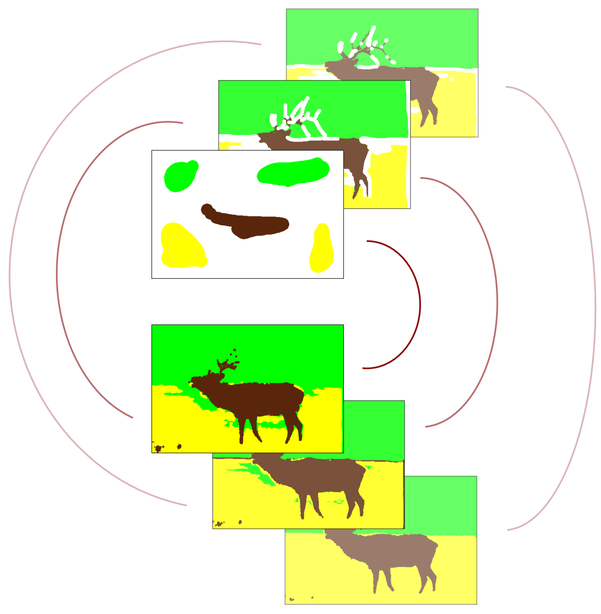
Strategy 1

The segmentation obtained from the previous iteration will be used as the label image for the next iteration. When using this strategy some pixels in the label image will be assigned to a wrong label.



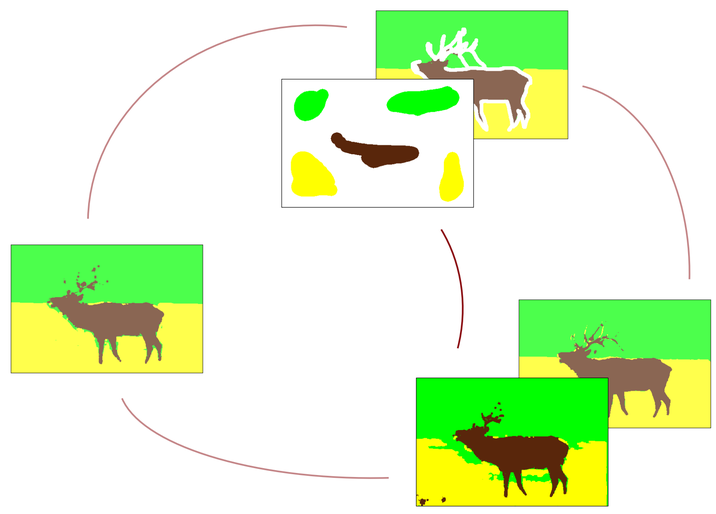
Strategy 2

The segmentation obtained from the previous iteration has areas that are labelled with the wrong class. These areas will be marked by the user as unlabelled and this will be used as the label image for the next iteration. The idea is that the elimination of the incorrect labels can be done fast and does not have to be very precise.



Strategy 3

The segmentation obtained from the previous iteration has areas that are assigned to the wrong class label. The user can then mark these areas as unlabelled or assign the correct class label. This will be the input label image for the next iteration. When assigning the correct class label to a pixel, the user must be very precise. This annotation option should be taken if it is easy to mark the pixels correctly or if the user thinks that marking specific pixels will improve the segmentation significantly.



Results

Result from strategy 1

Result from strategy 2

Result from strategy 3

Result of segmentation when using different strategies

	Original method	Strategy 1	Strategy 2	Strategy 3
Total annotation time	Very high	Very low	Low	Moderate
Accuracy	98,65%	91.94%	97,20%	97,81%

Annotation time can be significantly reduced with only a slight loss in accuracy.