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CONCLUSIONS

A comparison of four segmentation algorithms was done with a dataset of three remote sensing images. For this purpose, many experiments were developed. The comparison was based on a set of seven metrics for segmentation evaluation. The best values for each segmentation algorithm were found using the Nelder-Mead algorithm.

Three aspects have been considered to take a final decision about which segmentation algorithms provided the best results. The first one was a visual quality assessment. Specific areas were selected from each image and were compared. Correct object delineation was considered for assessment. The second one was the results obtained by each metric. This was the most important aspect that allowed an objective comparison among segmentation algorithms. The last one was the Precision and Recall plots. This particular metric demonstrated to have rich information about the quality of the segmentation. It is sensitive to over- and under-segmentation, and was used as a final decision criterion.

Four segmentation algorithms were studied with different approaches: clustering-based, graph-based, Bayesian-based and region growing-based. Taking into account the aforementioned criterion for evaluation, one algorithm performed best. In fact, the Graph-based (Gb) segmentation provided the best results on the given dataset. It got the lowest or close to the lowest values for each metric (see Table 2, Table 3 and Table 4). Moreover, Graph-based segmentation gave the best values of Precision and Recall according to the plots in Figure 25, Figure 26 and Figure 27. Region Merging-based (Rm) and Mean-Shift (MS) segmentations are considered as the second best among the algorithms selected for this study. Mean-Shift segmentation usually provided under-segmented results. On the other hand, Region Merging-based segmentation often delivered results with over-segmented areas.

The Nelder-Mead algorithm, for parameter tuning of each segmentation algorithm, demonstrated a good performance at this task. An extension of this

study would involve adding new metrics for segmentation evaluation as well as segmentation algorithms.

Based on the Nelder-Mead algorithm, Region Merging-based (Rm) segmentation needed more iterations to find its best configuration of parameters. It was due to the number of parameters to tune and the wide range of possible values that they could take.

The prototype developed to test the algorithms is in a way to be a free distributable software for segmentation parameter tuning. A friendly graphical user interface (GUI) is under development which will allow the users to easily perform a parameter tuning and replicates the experiences and results obtained in this work for further analysis.

In this study, the Conditional Random Fields-based ($CRFb$) segmentation did not provided the best results. However, it was mainly due to the reduce data given for training. The original code worked with many images and it was adapted to work with one single image which seems to be the main reason for its poor results. For that reason, it is not possible to give a general conclusion about it. It is desired to evaluate this algorithm in a more appropriate form in the future due to the high importance this approach is gaining in the last years.