

ECE 491 – Computer Vision
Spring 2019
Final Project – Proposal

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I. Proposal

Although current image segmentation methods typically leverage deep learning approaches there are several traditional segmentation methods that provide interesting results. Class discussions included using clustering methods such as k-means as well as the mean-shift algorithm as solutions for segmentation. For both of these, the assumption has been to use either greyscale or RGB images to produce the feature set used to describe the image scene for segmentation. For our final project we are proposing to extend the feature vector under consideration to include information from other color space transforms (particularly hue and saturation) as well as using multispectral images coupled with associated spatial information. Therefore, our primary aim with this proposal is to explore certain solutions (and extensions to those solutions) in the domain of image segmentation. We will implement k-means and mean-shift image segmentation algorithms as a base-line to compare to our proposed extensions (and perhaps deep learning methods if time permits) and evaluate performance differences.

II. Division of Work

Currently, we envision several high-level tasks that need to be achieved to successfully complete the implementation and analysis of our proposal within the project time constraints. The list below outlines the major tasks that we will divide equally during project implementation and make an accounting for in the final report.

1. Project initialization (repo setup, software architecture design, etc.)
2. Dataset acquisition
3. Clustering segmentation implementation for baseline (k-means) using RGB
4. Mean-shift implementation using RGB (baseline)
5. Color space conversion code (Hue Saturation Intensity, YUV, etc.) for color space features
6. Multispectral data structures and support code
7. Final implementation
8. Result analysis (ground truth determination, ROC curves, etc.)
9. Comparative analysis to implemented traditional methods (and possibly against deep learning)
10. Documentation

III. Referenced Papers

1. Johannes Jordan and Elia Angelopoulou. Mean-Shift Clustering for Interactive Multispectral Image Analysis. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.639.1745&rep=rep1&type=pdf>
2. Mustafa Ozden and Ediz Polat. Image Segmentation Using Color and Texture Features. <https://www.eurasip.org/Proceedings/Eusipco/Eusipco2005/defevent/papers/cr1950.pdf>
3. Arthur Robert Weeks and G. Eric Hague. Color Segmentation in the HIS Color Space Using the K-means Algorithm. <https://www.spiedigitallibrary.org/conference-proceedings-of-spie/3026/0000/Color-segmentation-in-the-HSI-color-space-using-the-K/10.1117/12.271117.full?SSO=1>.