

Domain Background:-

The domain background of the project is in image segmentation from computer vision. The goal of image segmentation is to partition an image and its pixels into different segments that may represent different objects, classes, or priors. In this project we are going to be looking at image segmenting of backgrounds.

Problem Statement:-

There are already multiple algorithms that solve image segmentation with a variety of supervised and unsupervised approaches. Of course, any image segmentation technique has to be evaluated according to how accurately it performs the task and how long it takes to do so. Recently, Wang et.al. published a paper on a new unsupervised algorithm GraB which uses a graph model utilizing local and global saliency cues (see:- “GraB: Visual Saliency via Novel Graph Model and Background Priors”). In this project, we intend to implement this algorithm in open source.

Datasets and Inputs:-

We intend to use the THUS10K dataset. This dataset contains ground-truth labelings of over 10,000 images.

Solution Statement:-

To implement this image segmentation project, we follow the approach described extensively in the paper by Wang et.al. This involves implementing the GraB algorithm using the following sequence of steps:-

- 1) Segment image into superpixels via Simple Linear Iterative Clustering and build regional field descriptor from color and texture information.
- 2) Construct an undirected weighted graph where each set of nodes corresponds to superpixel while edges are constructed using graph model using weight matrix calculated using distances from extracted feature descriptors.
- 3) Select three borders as query seed and acquire saliency estimation assuming these borders are background.
- 4) Optimize saliency map

Benchmark Model:-

We will compare this model to another implementation to generate saliency maps as reported in paper by Perazzi et.al. “Saliency filters: Contrast based filtering for salient region detection” and as implemented in open source on github <https://github.com/arifgodari/saliencyfilters> which we plan to take advantage of.

Evaluation Metrics:-

We will evaluate the implementation by comparing the precision recall curve.

Project Design:-

We plan to design the project in Jupyter Notebook with python as follows:-

- 1) Obtain and archive the image database which we will use as input
- 2) Explore the image database to get a qualitative idea of the inputs we are dealing with
- 3) Implement the Solution using the GraB algorithm
- 4) Evaluate performance versus alternative solution from open source as specified