Image Processing Using Graph Theory

**Abstract:**

# In computer vision, Segmentation (Image processing) is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. In general, it is the process of partitioning an image into multiple segments (sets of pixels) with the goal to simplify the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries in images.

# This study project aims at identifying a few algorithms for solving image segmentation problems using the concepts of graph theory (ex: Euler graphs). Graph partitioning has been studied as a way of image segmenting. In the past few years, the normalized cut has been widely used in order to implement graph partitioning, based on the graph spectra analysis (eigenvalues and eigenvectors). This area, known as spectral graph theory and Euler graphs are used to solve the segmentation problems.

**Methods:**

The approach is to treat image as an undirected

Weighted non-planar finite graph and handle image segmentation as graph partitioning problem.

By treating image segmentation as a graph partitioning problem, the normalized cut for segmenting the graph can be proposed. The efficient computational technique based on a generalized Eigen value problem can be used to optimize this criterion. This approach can be used to segment both static images, as well as motion sequences. We can provide image segmentation based on normalized cut, with image representation based on the component tree and on its scale-space analysis.

**Keywords:**

Image segmentation, Graph theory, Euler Graphs, Cycles, Graph

partitioning, Spectral graph.

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