# cs512 Final Project Proposal: Report

## Imran Ali
Graduate student, A20362180
Department of Computer Science
Illinois Institute of Technology

## Arun Rajagopalan
Graduate student, A20360689
Department of Computer Science
Illinois Institute of Technology

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## 1 Problem statement
To improve the performance of content based image retrieval by using binary tree structures to describe high level image features in addition to the usage of color and texture features.

## 2 Proposed solution
The overall structure of the image retrieval system has seven separated parts: 1. Image database consisting of hundreds or thousands of images among which a query image is searched; 2. Feature Extraction which retrieves features from images and sends them to appropriate parts; 3. Database of extracted features received from part 2; 4. Input Query image. 5. Feature Vectors of query image 6. Search and retrieval part that searches the Feature Vectors database in order to find the images similar to the query image; 7. User interface which shows the retrieved images from part 6.
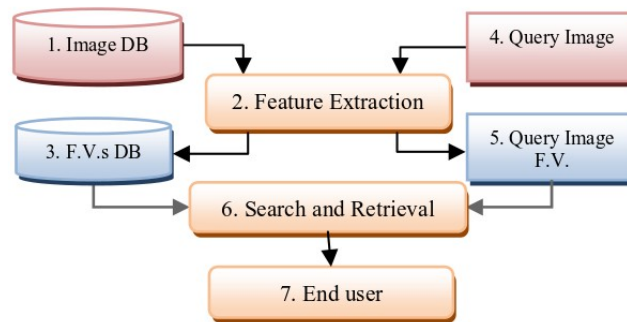
*Illustration 1: Overall structure of an image retrieval system*

In the proposed approach, feature extraction is divided into three steps, color extraction, texture extraction and producing binary tree corresponding to each images.

## 3 Details on approach

## 3.1 Feature Extraction

## 3.1.1 Color Extraction
In this project, the HSV color space is used because of its perceptual uniformity and the approach here is to extract two histograms, one for Hue and one for Saturation. Since V is directly related to

brightness level, it is not considered in the color measurement approach.

### 3.1.2 Texture Extraction
Texture extraction routine is composed of: 1. dividing image into 8×8 = 64 equal regions; 2. applying Wavelet on each region. 3. calculating Mean and Variation of four sub-images correspond to each region and concatenating them; 4. concatenating all Mean and Variance feature vectors of every region. At the end of this routine, two vectors will be obtained which describe texture information of image.

### 3.1.2 Binary Partitioning Tree
Binary Partition Tree is a structure to represent the regions of an image where image partitioning is done first based on color homogeneity, followed by the tree construction. To construct a binary tree, the algorithm starts from an arbitrary region as the first node and chooses a neighbour region as its sibling and these nodes will be added as children of their parent node. This process will be repeated until all regions have been added to the tree.
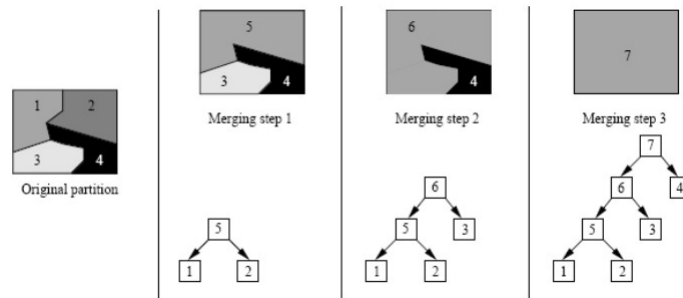


*Illustration 2: Binary Partition Tree creation with a region merging algorithm*

### 3.1.3 Search and retrieval
The search and retrieval is based on measuring the distance between feature vectors (color, texture and tree) of query image and the target image. The rank of each target image is calculated based on their distance from the query image. We can compare the efficiency of the proposed system by retrieving images with and without binary tree structure.

### 4 Details on image data:
We will be having 5 different query images and these will be checked against the target images (~100-200) present in our database. The sample query images are present in the data folder.

### 5 References:
Content based image retrieval using knowledge of texture, colour and binary tree structure: Canadian Conference on Electrical and Computer Engineering, 2009. CCECE '09. Authors: Mansoori, Z. ; Sharif Univ. of Technol., Tehran ; Jamzad, M.
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