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Description automatically generated

**Ain Shams University**

**Faculty of Computer and Information Science**

**Scientific Computing department**

**Ain shams university**

**Faculty of computer and information science**

**Bioinformatics department**

**Project Title**

**Image Quantization**

**By**

|  |  |  |
| --- | --- | --- |
| **Name** | **ID** | **Section** |
| **Nour Mohamed Hussein Kamaly** | **20191700701** | **5** |
| **Nourhan Abdel-Karim Khalaf Abdel-Hafez** | **20191700716** | **5** |
| **Mohammed Nour-Elden Abbas Ismael** | **20191700583** | **4** |
| **Abdul-Rahman Sayed Ali Mohammed** | **20191700339** | **3** |

**Under the supervision of**

**Dr. Ahmed Salah**

**Computer Science Department,**

**Faculty of computer and Information Science**

**Ain Shams University**

**Functions Description:**

* **Get Distinct Colors.**
* **Minimum Spanning Tree.**
* **Clusters Construction.**
* **Get Cluster’s Representative Color.**
* **Quantization.**
* **Automatically Detect Clusters.**
* **Calculate Mean.**
* **Calculate Standard deviation.**
* **K-Clusters Detection.**
* **Get Distinct Colors:**
* Name: getDistincitColors.
* input: ImageMatrix.
* output: List of distinct RGB pixels.
* Description: Extract distinct color from image matrix.
* Overall Complexity: O(N^2)Table

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* **Minimum Spanning Tree:**
  + Name: mininmumSpanningTree.
  + input: DistinctColors.
  + output: Array of struct of MST vertices.
  + Description: Construction Minimum Spanning Tree.
  + **A picture containing table

    Description automatically generated**Overall Complexity: O(V^2)
* **Clusters Construction :**
* Name: getKClusters.
* Input: array of struct of MST vertices, number of clusters, list of distinct colors.
* Output: dictionary composed of each distinct color and the number of cluster it belongs to.
* Description: adds colors with minimum edge weight to the same cluster.
* Overall complexity: O(K\*D)

**Graphical user interface, text, application

Description automatically generated**

* **Get Cluster’s Representative Color:**
* Name: getClusterRepresentitive.
* Input: dictionary of clusters, list of distinct colors.
* Output: dictionary composed of the ID of the cluster and an array of size 3 representing its representative color in red, green, and blue
* Description: loops over the distinct colors and calculates the mean of the colors belonging to the same cluster.
* Overall complexity: O(D).

**Text

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* **Quantization:**
* Name: Quantize.
* Input: Image Matrix. Dictionary of color number and its cluster number. Dictionary of cluster number and its representative color. Dictionary of hexadecimal color and its corresponding index.
* Output: Quantized Image Matrix.
* Description: Replaces each RGB color value of each pixel in the image matrix by the representative color of its cluster.
* Overall complexity: O(N^2).

**Text

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**Automatically Detect Clusters:**

* **Calculate Mean:**
* Name: calculateMean.
* input: alledges.
* output: Calculate mean.
* Description: Calculate mean of all edges.
* Overall Complexity: O(E).
* **Calculate Standard deviation:**
* Name: calculateStandardDeviation.
* input: alledges.
* output: Array of struct of MST vertices.
* Description: Calculate Standard Deviation of all edges.
* Overall Complexity: O(E).
* **K-Clusters Detection:**
* Name: KClustersDetection.
* input: Mean, Standard deviation of all edges.
* output: Number of detected clusters.
* Description: Detect clusters.
* Overall Complexity: O(E^2).

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Description automatically generated**