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**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.**
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  Description automatically generatedOverall 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)**

**Text

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* **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)**

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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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