ASSIGNMENT-1 REPORT

Description: - Scalar field visualization of Grand Canyon 2D dataset. Perform color mapping, meshing using height, and contour mapping.

Data Set Information:- The data set is Grand Canyon 2D dataset given in .bmp format. Here the intensity value at every pixel represents the height at that pixel. The width of image is 4097 pixels and height is 2049 pixels.

Data Processing: - The intensity value at every pixel is converted into the 0-1 value range.These intensity values are corresponding to the height in the output. Lighter the pixel color in greyscale image, greater will be the height of that point in the 3D scene. That value at every pixel is multipled with the desired max_height and store the value into 2D array of height and based on that the color mapping value is find out at every pixel and stored that into 2D array of Color.

Visualization Algorithm And Implemenatation: -

1. Elevation Mapping:- The intensity value at every pixel is converted in the ratio of desired height range. The resultant value is stored in the 2D array. The value at every pixel is the height of that cell.

2. Color Mapping:- In order to move from a garyscale to arbitary color gradient, we use a colorMap function to find out the color value. In the colorMap function based on the intensity value the color value associated. We implemented the heatmap.

3. Comtour Mapping :- For contour mapping the marching square algorithm used.
Marching Square algorithm:-
1. Select a cell.
2. Calculate the cell index by comparing the values at cell corner with the contour lever threshold value.
(i) To apply threshol value to the 2d field :-

- If the data value is above the isovalue then 1.
- else 0.

(ii) For each cell in the contour grid:-

- Compose the 4 bits value at the corner of the cell to build a binary index:- walk around the cell in clockwise direction append the bit to index, using left-shift from MSB to LSB. The resulting values in the range 0-15.

3. Based on the cell Index apply the function to draw the line and linear interpolation appled to find the exaxct position of the contour line along the edge of the cell. The contour lines are represented in the white color.

Insights :-

1. The 3d elevation mapping of the grand canyon data set. Gives the height at every point. Using that the height can be comapred with other points.
2. Color Mapping is implemend using heatMap. So if the hight at any point is high, low, and medium then consequently they are represented using red, blue and green color. So its easy to find the peak, river, field and valley.
3. The contour mapping generates the contour lines, using contour lines it is easy to find the same level elevated points.