CUT-FILL ANALYSIS FOR SLOPES

The inputs for the program such as boundary json , DTM file and the base station height are given and the required data is derived from the files such as the coordinates of the boundary, ground sampling distance(gsd), etc. Each boundary is assigned to a different thread so that each logical core on the system is made use of. So, there are multiple threads running at the same time with each one processing for different boundary

Under each thread, the corresponding data for the boundary is copied. Polygon is created from the coordinates acquired. Based on the direction given in the json file, starting points for each polygon is calculated. Starting points for each polygon is calculated by finding the direction of each line as given in the boundary. Since lines can run in two directions, the boundary is reversed and the direction checks are run again. If direction matches, starting points of the lines matched are stored as the starting points of the polygon. Then a linestring is formed from the two starting points.

The max and min of both x and y are taken to calculate the bounding box of the polygon. The bounding box coordinates are then converted to the corresponding pixel values on the dtm file. The acquired pixel values are given buffer of an additional 20 pixels.Empty Image is created for the calculated pixels.

Loop is run on the pixels acquired and the elevation for each pixel is obtained from the DTM file. Each pixel is converted to coordinates and the coordinates are checked if the are within the boundary or not. Then the elevation is checked if it is greater than or less than the required height of the pixel.The required height for the sloped structure can be calculated by slope equation slope=(z2-z1)/distance. Distance is the perpendicular distance from the starting line to the point on structure where the height(z2) needs to be calculated.And the z1 is the starting elevation as given. Slope is either given or calculated based on the input types.From these we get the equation. If angle is given instead of slope, slope can be obtained by getting tan(angle). If elevation is given, then the distance between the start point and the end point is calculated. The elevation difference is calculated by subtracting the base station height and the elevation given in json file.Slope=elevation difference/distance.

Height of the point=(slope*distance)+base height given

If the elevation is greater, then the height difference is added to the cut array and color for the pixel is added as red to the empty image created earlier. If the elevation is less, hen the height difference is added to the fill array and color for the pixel is added as green to the empty image created earlier. After the loop is executed, the sum of cut array and fill array are obtained. The volumes are obtained by

multiplying gsd twice to the sum of the arrays.The corresponding cut and fill polygons are obtained using the solaris module.

The data from each thread is extracted and then the data is converted to the json file as required.