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AEM: 10566

Code Documentation

Functions:

vector_interp(p1, p2, V1, V2, coord, dim)

1.

Description: Interpolates a vector V between two points p1 and p2 based on a specified coordinate and dimension.

Parameters:

p1: Tuple, coordinates of the first point.

p2: Tuple, coordinates of the second point.

V1: List, vector at the first point.

V2: List, vector at the second point.

coord: Float, coordinate value for interpolation.

dim: Integer, dimension (1 or 2) indicating the axis of interpolation.

Returns: Interpolated vector.

check_for_duplicates(line1, line2, vertices)

2.

Description: Checks for and resolves duplicate vertices between two lines.

Parameters:

line1: List, vertices of the first line.

line2: List, vertices of the second line.

vertices: List, coordinates of vertices.

Returns: Modified line1 and line2 without duplicate vertices.

construct_edges(img, x1, x2, y1, y2, a, b, B, G, R)

3.

Description: Constructs edges between two points on an image.

Parameters:

img: NumPy array, image data.

x1, y1: Integers, coordinates of the first point.

x2, y2: Integers, coordinates of the second point.

a: Float, slope of the line.

b: Float, y-intercept of the line.

B, G, R: Floats, color values for the line.

Returns: List of points representing the constructed line.

is_vertice(x, y, vertices)

4.

Description: Checks if a given point is a vertex.

Parameters:

x, y: Integers, coordinates of the point.

vertices: List, coordinates of vertices.

Returns: Boolean value indicating whether the point is a vertex.

draw_img(img, x, y, x1, y1, x2, y2)

5.

Description: Draws on the image using interpolated colors.

Parameters:

img: NumPy array, image data.

x, y: Integers, coordinates of the point to draw.

x1, y1: Integers, coordinates of the first point for interpolation.

x2, y2: Integers, coordinates of the second point for interpolation.

f_shading(img, vertices, vcolors)

6.

Description: Performs flat shading on the image.

Parameters:

img: NumPy array, image data.

vertices: List, coordinates of vertices.

vcolors: List, colors of vertices.

g_shading(img, vertices, vcolors)

7.

Description: Performs Gouraud shading on the image.

Parameters:

img: NumPy array, image data.

vertices: List, coordinates of vertices.

vcolors: List, colors of vertices.

Main Code:

Loads data from 'hw1.npy'.

Sorts the indices based on depth.

Iterates through the sorted faces and performs shading on the image using either flat or Gouraud shading methods.

Displays the final image.

How It Was Written:

The code is written in Python.

It utilizes libraries such as NumPy, OpenCV (cv2), and matplotlib.

Functions are used to encapsulate specific tasks such as interpolation, edge construction, vertex checking, and shading.

The main code segment loads data, sorts indices, iterates through faces, performs shading, and displays the final image using OpenCV.


Final