

Computational Mathematics

CM2104

Report

C2032382

Task 1

For Task 1 I had to create a function that enables the user to draw a polygon. I created the *drawpolyfunc* function for that. When the user runs the code, a new window with a coordinate system opens. The user can draw a polygon. Then the user can save the polygon. I implemented a new function, called *save_function*, which saves the polygon's coordinates in a text file, called *saveshape.txt*. The user can close the window and use the *load_shape* function, which opens the saved polygon, which is loaded from the text file. I wrote a few pseudocodes just to be able to visualize the task more and be able to do it quicker. I created buttons, using *appdesigner*. When the user writes *drawpoly* in the Command Window, a new window is shown containing three buttons:

-Draw polygon

- Save polygon

-Load polygon

When the user saves the polygon, the angles, the MBR, the circles and the intersections with them and the magenta segments from polygon edges in the annular ring are shown. When the figure is closed and then loaded again, the same information is shown again.

Task 2

For Task 2 I created a function called *angles*, which calculates the angles of the polygon in radians. I converted them into degrees. Then I implemented a colored disk at each vertex, which is determined by the value of the angle. There is a colormap next to the figure, which shows the colors of the angles in range [0,360]. For the color map I used *jet colormap*, which shows accurately which color corresponds to each angle.

Task 3

For Task 3 I extended the *MBR1* function even more, I plotted a minimum bounding rectangle (MBR), which is around the polygon. Then I calculated the MBR's middle point. I used this middle point to plot two circles with different radius, one was half of the height and the other one was half the width of the MBR. Then I had to plot the intersections between the polygon and the two circles. I did a lot

of research, because I struggled a lot with this part of the coursework. I found a function called *linexlines2D*, which helped me to find and plot the intersections. The function puts a * where there are intersections between the polygon and the circles.

Task 4

For Task 4 I extended the *MBR1* function. I had to plot the magenta segments from polygon edges in the annular ring. I used the *linexlines2D* function for it. The function creates a matrix of the points so matrix multiplication could be carried out. Then the matrix multiplication is being performed using the points of the first line segment and the center point of the two circles. Then the segments are plotted in magenta color.