Documentation for the Projection Method

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About the Program

This program implements the projection method. Specifically, it

1. constructs the mesh grid and calculates the cell centers,
2. initializes $u(x,p)$ values by applying the initial condition $\tilde{u}(x,p)$,
3. solves the linear system in (3.33) to compute $\alpha_i = \lambda_x(x_i)$, $1 \leq i \leq N_x$,
4. applies the projection method by using the α_i values on $u_{i,j}$, and
5. numerically calculates the values $\left|\frac{\partial}{\partial x}\int_{p_A}^{p_B(x_i)} u(x_i,p)dp\right|$ at all x_i and evaluates the accuracy of the projection method

How to Run the Code

The code is written in MATLAB. To run the code,

1. unzip the contents of the `.zip` archive to a folder,
2. navigate to the folder in MATLAB, and
3. run the `main()` function.

The console printout of the `main()` function gives the location x_i at which $\left|\frac{\partial}{\partial x}\int_{p_A}^{p_B(x)} u(x,p)dp\right|$ is the largest, along with the max value.

Note on the Barycenter Calculations

The calculation of the barycenters in the function `calcCellCenters()` follows the numbering and orientation of the vertices illustrated in the following plot.

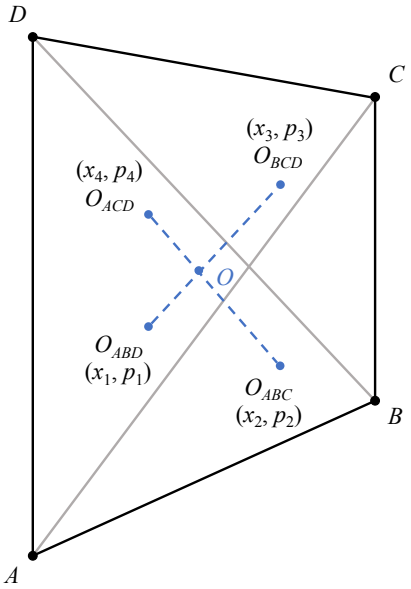

Figure 1. *In the graph, O represents the barycenter of the trapezoid.* O_{XYZ} *is the center of the triangle* ΔXYZ.