Panel Method: A Basic Application for Hand-Drawn Airfoils

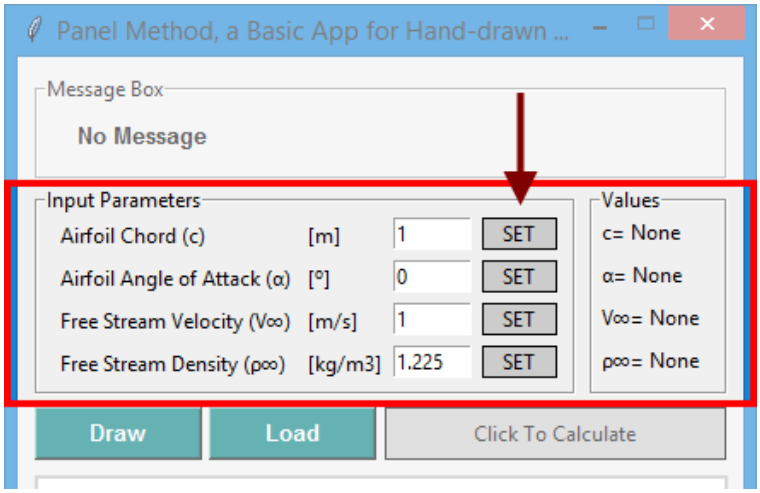
About

This simple program has the objective to calculate common airfoil parameters by just setting a few inputs and drawing the geometry of the body in a dynamic way. There is certain freedom for the user to draw any airfoil (or arbitrary figure) by connecting dots, interpolating and later applying the Panel Method theory to do the calculations.

Setting the Airfoil

Input Parameters

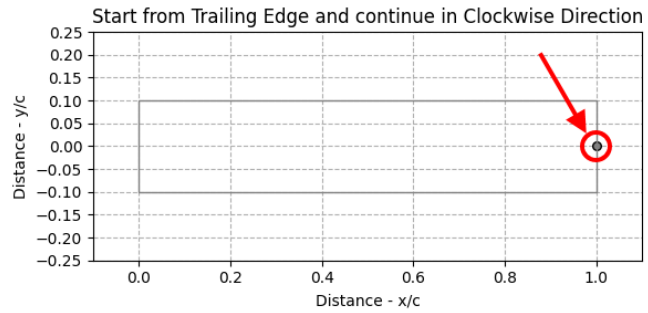
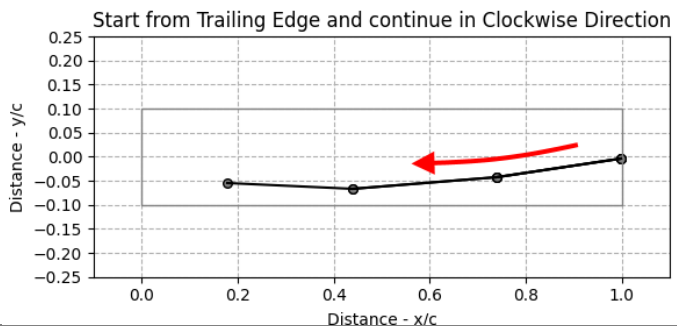
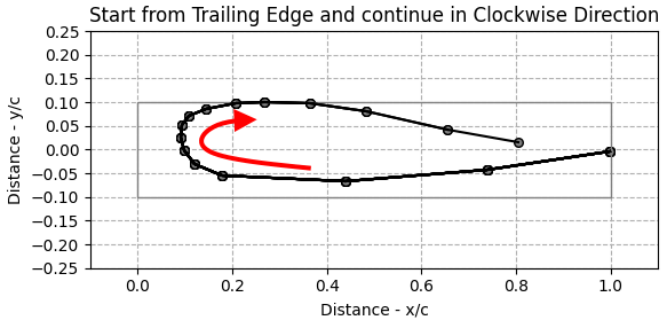
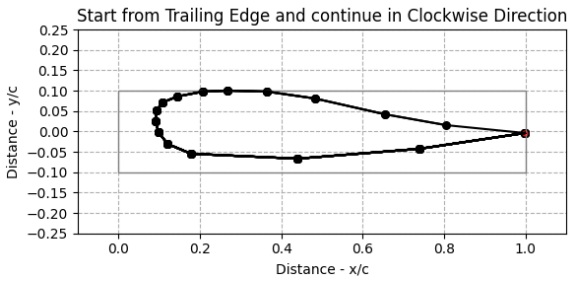
The user must set four aerodynamic and geometric parameters for the calculation to be done. This is a very straightforward action, done by clicking the **SET** buttons as seen below. The default values are unit chord and unit velocity, zero angle of attack and air density at sea level.



Drawing / Loading Airfoil

By clicking **DRAW,** the user is able to draw any arbitrary airfoil by connecting dots. However, some things should be noted in order for the calculation to return meaningful output:

1. The first dot has to be located at the airfoil trailing edge.
2. The airfoil has to be drawn in a clockwise direction.
3. The airfoil must be connected back to the trailing edge.

Step 1: Locate trailing edge	*Step 2*: Draw in clockwise direction
	
	*Step 3*: Connect back to trailing edge 

The program itself is going to use a spline method to interpolate the dots and make a much smoother airfoil.

Notes:

- Airfoil coordinates are in relation to the chord.
- The gray rectangle is used just for reference.

By clicking **LOAD,** the user is able to load several NACA airfoils. New files can be uploaded to the “SampleAirfoils” folders. The “x” and “y” coordinates in these files are also set in clockwise direction, with the last node being the same as the first (the trailing edge).

Output Parameters

Once the input parameters and airfoil are set, the user can calculate the output parameters by clicking the “Click to Calculate” button.

Some common parameters such as lift and moment coefficients are seen in the main window, while three plots are available for visualization (velocity stream plot, pressure coefficient over airfoil, and pressure coefficient contour plot).

For example: