3D Printing — Spring 2017 — Dan Halperin

Assignment no. 1

due: April 3rd, 2017

Exercise 1.1 Given a simple polygon with n vertices in the plane and a real parameter $w > 0$, describe an efficient algorithm to compute the orientation in which the polygon should be placed on the base of a "two-dimensional" 3D printer of width w, such that its height is minimized. See the figures for examples.
Implement the algorithm and produce alphanumerical as well as graphic results, using *ipe* for instance. The implementation does not have to be of the most efficient algorithm. Any near-linear time algorithm will do. The alphanumerical output is the angle in radians that one needs to rotate the polygon counterclockwise in order to put it in the printer at a minimal-height position.

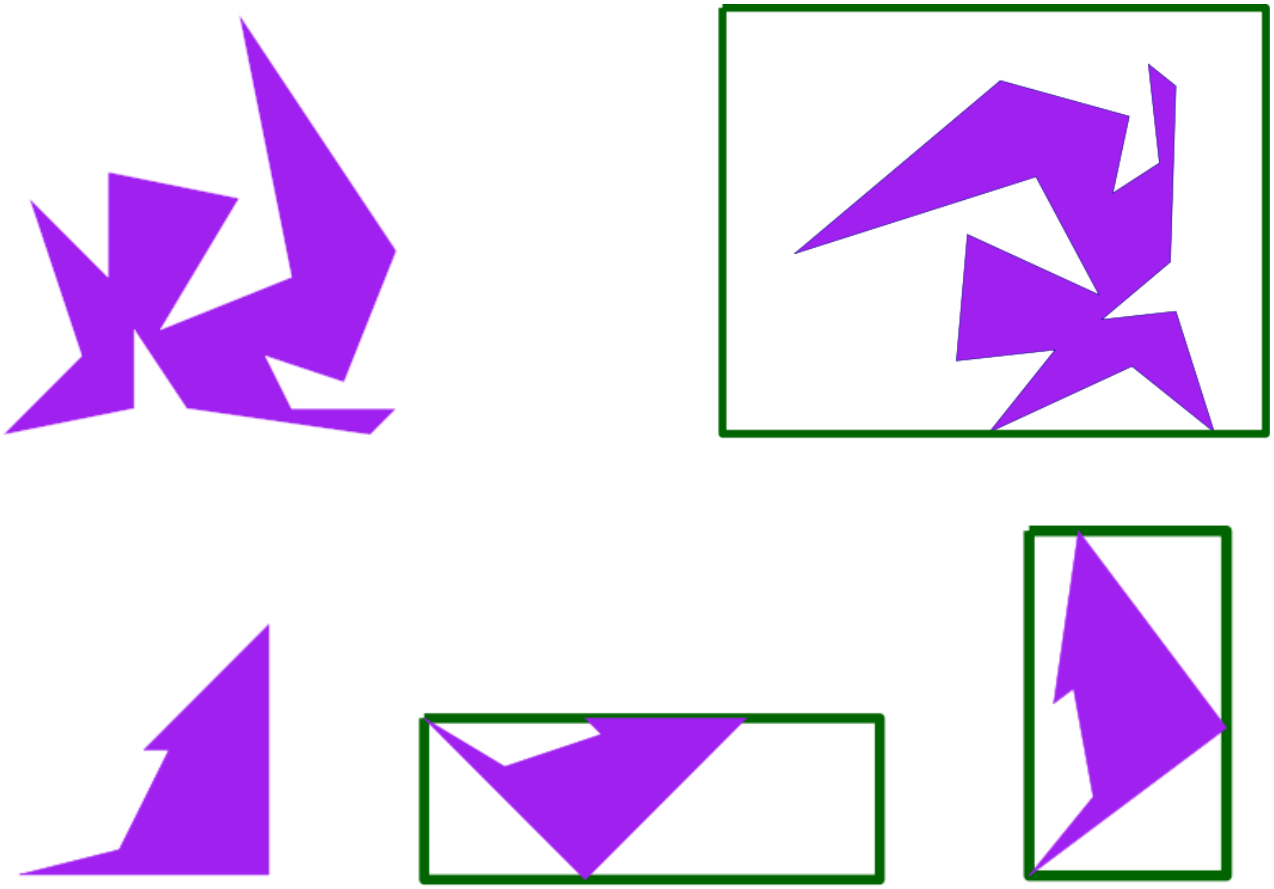

Figure 1: Top row from left to right: an input polygon and its placement in the printer. Bottom row from left to right: another input polygon, its placement in a wide printer and its placement in a narrow printer.

Notice that there is an additional exercise on the other side of the page.

Exercise 1.2 Write a program that reads an stl file and uniformly scales the model in the file such that the scaled model is the largest that could still fit into an axis-parallel box with dimensions **30mm x 30mm x 10mm**. Output the scaled model into a new stl file.
Download an stl file from one of the repositories, run your program on it, and 3D-print the resulting object (the stl that you produced) on an FDM printer like the course's Ultimaker 3.