ADA University
School of Information Technologies and Engineering
CSCI 2408: Computer Graphics
Spring Semester, 2018

Homework 2: Working with 3D models

It does not do to leave a live dragon out of your calculations, if you live near him.[1]

Instructions:

- **Write a program** (Windows Forms App with C#) using Microsoft® Visual Studio® (Community Edition) that will generate an OBJ file with a 3D model of a **dragon curve**[2] by using recursive calls to the same method. Below is the general idea of the final result shown in Microsoft® 3D Builder:
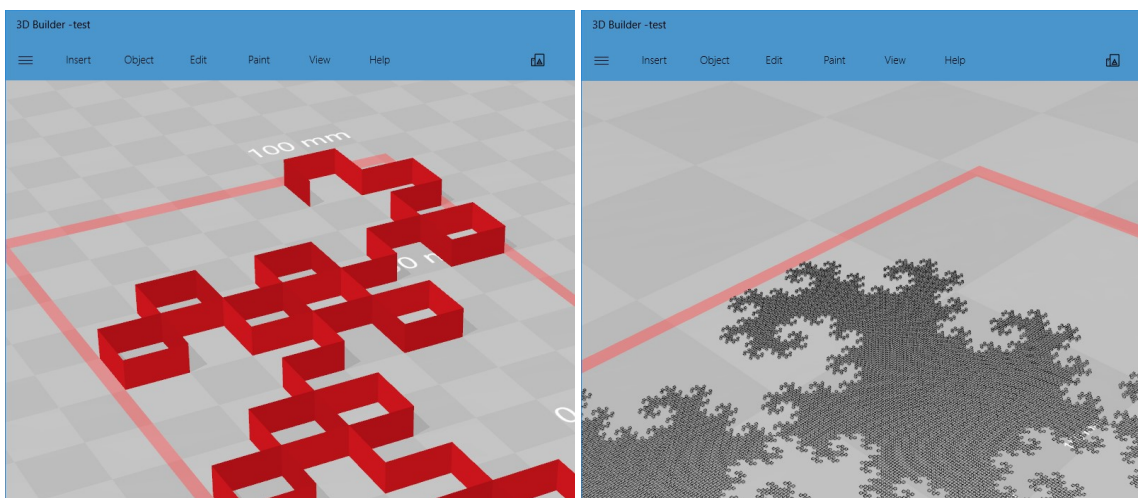

- **Your submission** must be a .ZIP archive (some surprisingly were not able to follow even this simple instruction for Homework 1) of the Visual Studio® solution/project folder. Make sure that it contains ALL the necessary files, so the grader can successfully compile and run your program, not solve technical problems in it.
- **The submission will be graded** based on the following criteria:
  - Correctly functioning code   60%
  - Well documented code   20% (not many paid attention in Homework 1)
  - Neat program code   10%
  - Solid use of OOP approach   10% (many missed in the Homework 1)
- **Documentation** is required to be in a form of commentary in the program code. It must explain the use of different parameters. It must include all references and cite any models, images, ideas, or algorithms that you did not develop yourself.
- **Minimum requirements** include the following:
  - Your application program should have an easy interface to enter the parameters for 3D curve generation, also the file name and location for saving the OBJ file.

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[1] The Homework 1 tagline "Time – not important. Only life – important." was a reference to *The Fifth Element* (1997) movie by director *Luc Besson*.
[2] The dragon curve is a recursive non-intersecting curve whose name derives from its resemblance to that mythical creature. Read more: https://en.wikipedia.org/wiki/Dragon_curve#[Un]Folding_the_Dragon

- o Your application program should open the OBJ file it has generated with default application installed in your system e.g. Microsoft® 3D Builder.
- o The curve should start from the origin of coordinate frame i.e. the point (0, 0, 0).
- o Keep in mind that although the illustration below shows the curve as line segments built on the x-y-plane, there is a z-dimension to it.
- o Note that you will have to use "f" command in OBJ file for faces.
- **The modeling process** goes as follows:
  - o The initial line segment starts on start point O (the origin of the coordinate frame), and continues along the x-axis for the length L till the end point O_1.
  - o At every next step all existing line segments are duplicated, and rotated around z-axis for the angle a_z with a center of rotation on the last end point O_n.
  - o Each segment is represented by a rectangle perpendicular to the x-y-plane, with the base on the corresponding line segment and height of h.
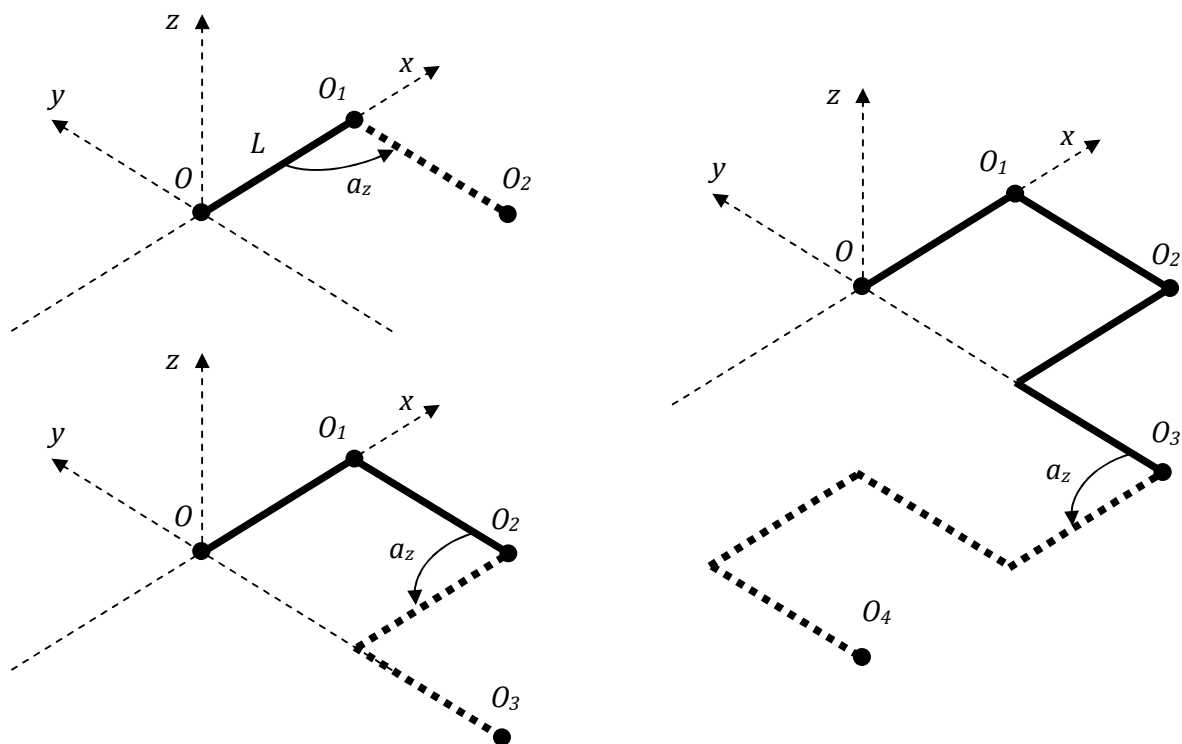
- **The parameters** are explained as follows:
  - o a_z (a_x, a_y) is the angle of rotation on each step in degrees with default value of 90. Other angles a_x and a_y will be needed only if you do the corresponding bonus.
  - o L is the length of each segment and h is the height of it with default values of 1 and 0.5 accordingly.
  - o S is the number of iteration steps with default value of 13.
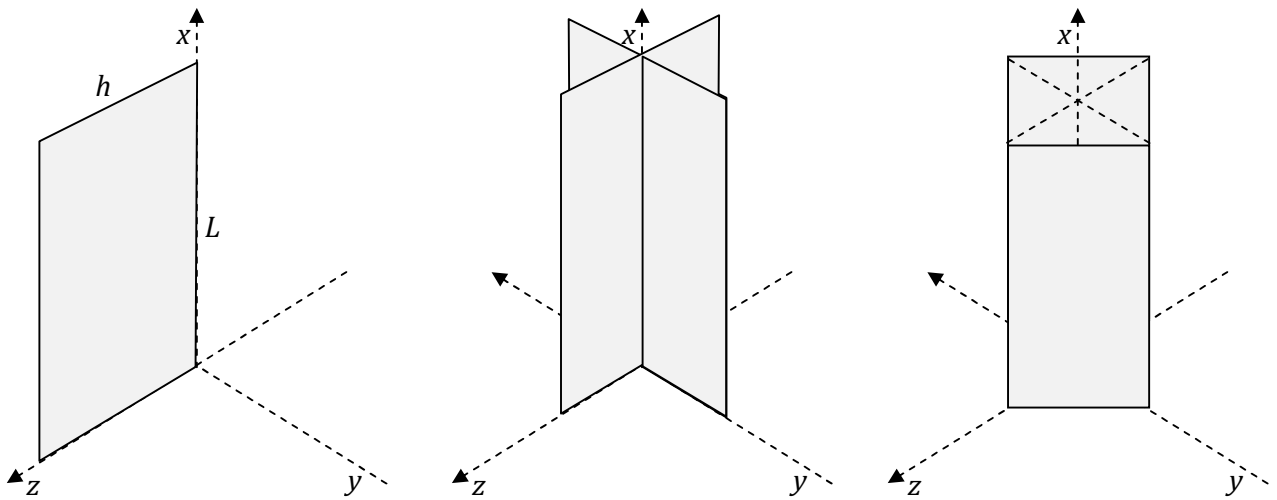
- **Bonus(es): Optional features** are listed below with percentages allocated for each:
  - Add 'thickness' to the model by replacing every segment represented by a rectangle (left image) with two rectangles crossing each other perpendicularly (10%) or by a four-faced hollow prism (15%) as shown on picture above (right image).
  - Make your program draw the 3D model it has generated (without calling an external application) and let the user scale it up and down, and rotate it around (15%).
  - There is no 3D generalization of the dragon curve. However our proposed option would be instead of rotation around z-axis at every next step, do rotations around z-axis for a_z degrees, in the next step rotation around y-axis for a_y and in the next step rotation around x-axis for a_x degree repeatedly. Implement this approach (15%).
  - Create a short online video explaining your program and demonstrating how it works. Publish your video online as a public post on Facebook or/and any other social media with hash-tags including #ADAUniversity, #CSCI2408 and #DragonCurve. Add the URL of the post to your program code documentation. (10%)

- **GOOD LUCK!**

- **This homework is to be done independently.** It is best to try to solve problems on your own, since problem solving is an important component of any course. You are allowed to discuss class material, homework, and general solution strategies with your classmates. You may use free and publicly available sources as research material for your answers. But, when it comes to formulating or writing solutions you must WORK ALONE.
- **Plagiarism** is using others' ideas and words without clearly acknowledging the source of that information. To help you recognize what plagiarism looks like and what strategies you can use to avoid it, see Indiana University's *Plagiarism: What It Is and How To Recognize and Avoid It* at http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml
- **Academic misconduct will not be tolerated** and will be referred to the ADA Honor Council. Penalties for misconduct will be a zero for this assignment, a fail grade in the course, and/or other disciplinary action that may be applied by the ADA Honor Council.