FractalComs problem-type for GiD

Abstract:

Creation of the GiD problem type ‘FractalComs’ which adds an ‘Antenna’ menu to GiD. From this menu two types of fractal antennas can be automatically created: ‘Koch line antennas’ and ‘Sperpinski triangle antennas’

Keyword list: Fractal antennas, GiD
FractalComs problem-type for GiD

WP3: SOFTWARE SIMULATION TOOL

TASK 3.1: ADVANCED MESHING OF FRACTAL STRUCTURES

1 INTRODUCTION

An automation tool has been created to build Koch-line antennas and Serpinski-triangle antennas easily from within GiD. This window is invoked through a new menu in GiD, called ‘Antennas’:

The procedure followed is the same for both cases:

- Create lines of the geometry
- Apply level of recursion
- Create surfaces of the geometry and control some potential problems
- Mesh the resulting antenna geometry.

In both cases the length of the antenna can be adjusted, and the path width too. The potential problems are related to the path/stripe width.

The strip of the ‘Line antennas’ are created just extruding a line along the Koch curve of the fractal. If this line width is too big then the strip can hide son elevations of the lines, and create intersected surfaces.

In ‘triangle antennas’ path connections are created between the different Serpinski’s sub-triangles. If the width of this connection path is too big, then some holes of the triangles will collapse.
2 LINE ANTENNAS

First, a line is created. In the next level of recursion the previous one is scaled, scaled and rotated, and mirrored. So we get this table:

First the guideline (polyline) of the antenna is created. To create the strip, a small line is created at one end of the ‘path’ and extruded through the path.

The maximum level of recursion is fixed at 10, which creates 1,048,576 surfaces, 3,145,729 lines, a polyline of 1,048,576 lines and 3,145,731 points.

Three layers are created in GiD:
- ‘LineaAntenna’ which holds the polyline of the Koch curve, of the Serpinski triangle,
- ‘WidthAntenna’ which contains the line which will be extruded along the Koch curve to create the strip and
- ‘Antenna’ which holds the surfaces of the line antenna strip.
The wizards also warn the user when the path width entered in the window is bigger than elevations. If this width is too big, some line elevations will be masqueraded by the strip, and some surfaces will intersect when doing the extrapolation.

The high of the smallest elevation is 0.032 and the width used to create the strip is 0.06.

The ‘suggested size’ of the elements is also changed when the user changes the ‘width’ entry.
3 TRIANGLE ANTENNAS

First a triangle is created. In the next level of recursion the previous ones are scaled and translated three times to create the Serpinski triangle. So we get this table:

Then the triangle surfaces are created.
The creation of the connection paths between triangles are done in four steps: creating the lines of connection between the triangles, intersect them against the Serpinski triangle, creating the surfaces and deleting the orphan lines and points:
The maximum level of recursion is fixed at 10, which creates 147,621 surfaces, 177,147 lines, and 177,147 points.

Three layers are created in GiD: ‘TriangleAntenna’ which holds the lines of the Serpinski triangle, ‘Antenna’ which contains the Serpinski triangle surfaces and ‘AnchoAntenna’ which holds the connection paths between triangles.

The ‘suggested size’ of the elements is also changed when the user changes the ‘recursion level’ entry.
The wizards also warns the user when the connection path width entered in the window is bigger than littlest hole of the triangle. If this width is too big, some holes will be collapsed, i.e. the recursion process will stop.