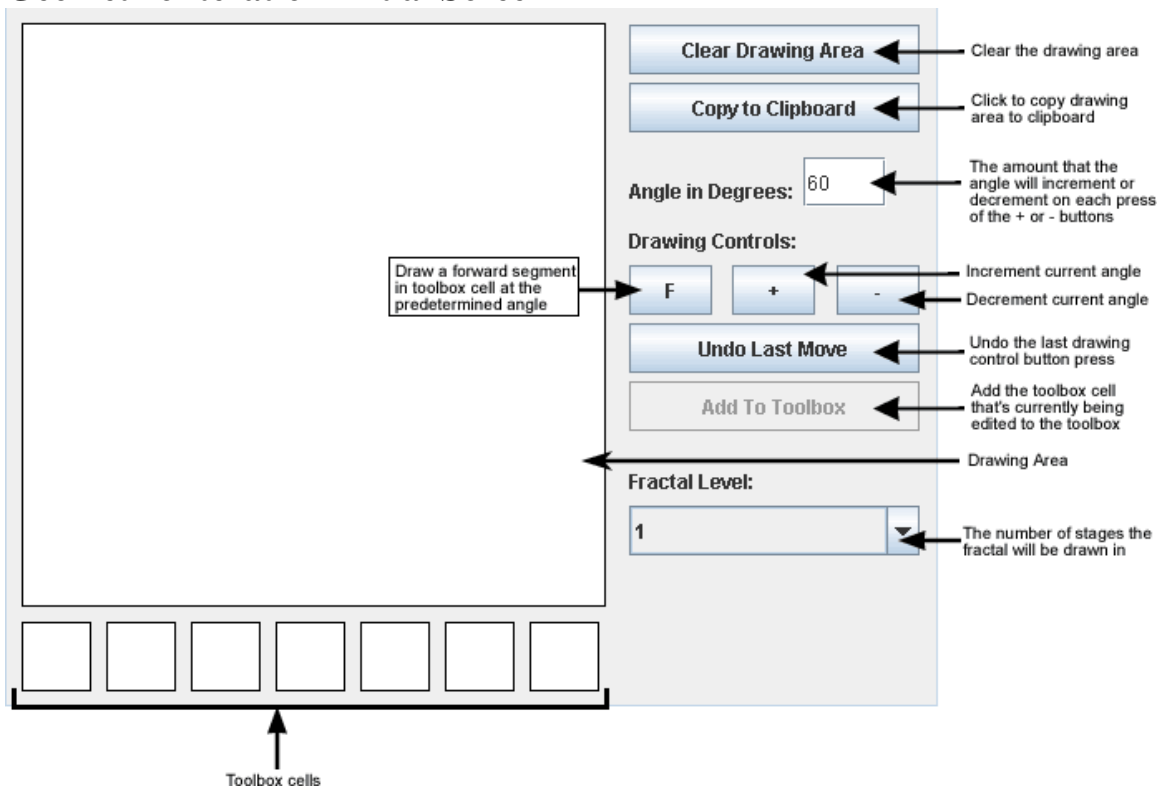# Geometric Iteration Overview

The Geometric fractal generator allows the user to create fractals from simple line combinations and shapes. The user first specifies these line combinations and shapes by a series of forward segments and associated incremented or decremented angle. This figure can then be added to the toolbox, selected, and then dragged out on the drawing area. The fractal level, which determines the number of stages the fractal will be drawn in, can be chosen either before or after the first stage of the fractal is displayed on the drawing area.

Geometric Iteration Initial Screen

How Geometric Iteration Generates Fractals

This algorithm generates fractals by replacing each line segment in an initial stage (defined by the user) with a scaled version of the whole initial stage as many times as specified in the Fractal Level.

Geometric Iteration Tutorial

Starting the Application
When the application begins, everything is blank, as below. The user must create basic line segments and shapes before adding it to the toolbox and generating a fractal.
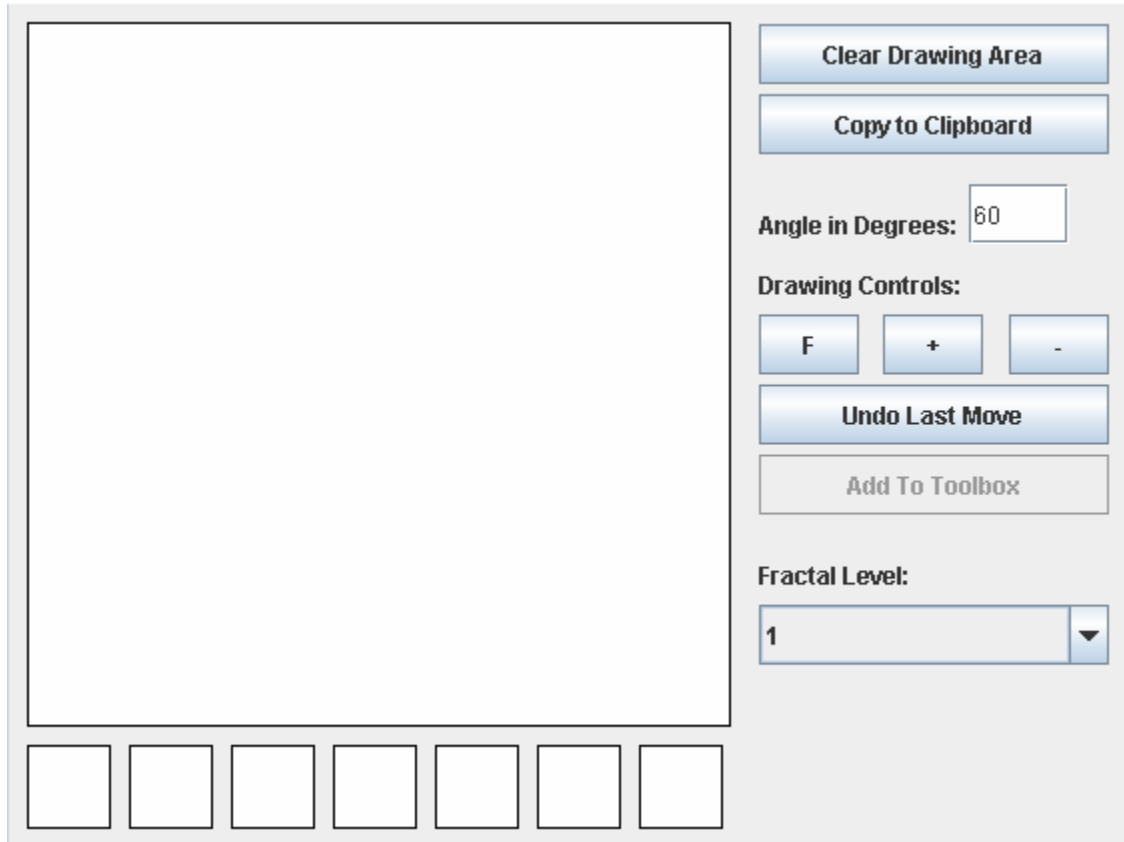

Designing the Initial Stage of the Fractal
The initial stage of the fractal is designed by using the Drawing Controls and the Angle in Degrees text box. As the user draws the initial stage, a preview is shown in one of the drawing cells in the toolbox below the main drawing area. The "F" button draws a line segment at an angle which is determined by the user. The user can alter the angle by clicking the "+" or "-" buttons, which increment and decrement the angle respectively. The amount that the angle is changed is dependent on the entry in the angle text box.

If the user makes a mistake, he or she can click "Undo Last Move" to step back a move. This can remove forward line segments, incremented degrees, and decremented degrees. "Undo Last Move" can be used to remove as many moves as desired.

For example, if the user enters a value of 60 in the angle text box, and clicks this sequence of buttons: "F, +, F, -, -, F, +, F", the drawing will be produced in the first available cell in the preview toolbox as seen below.
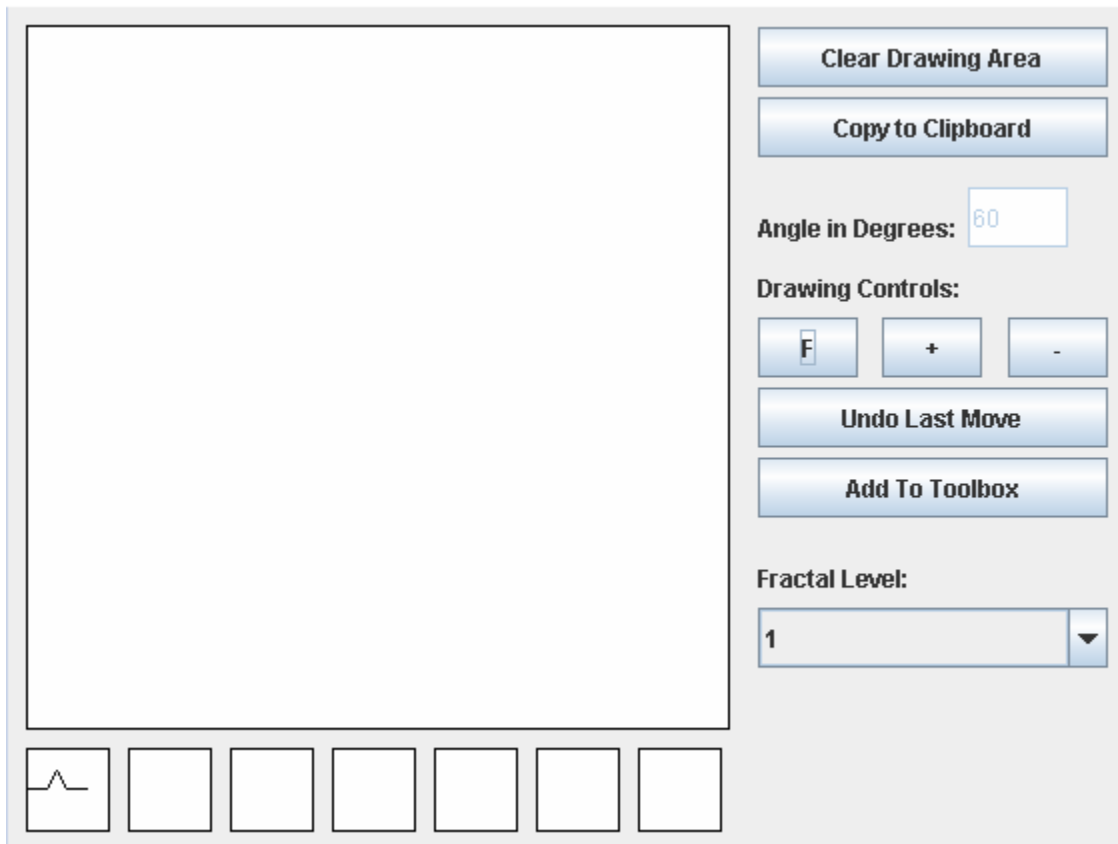

Adding the Initial Stage to the Toolbox
When the user is satisfied with the newly drawn initial stage, he or she must click the "Add To Toolbox" button to finalize the stage and allow its use in further processing.

The user can design and add up to 7 initial fractal stages.

Drawing the Initial Stage in the Main Drawing Area

Once the user has added at least one initial stage to the toolbox cells, he or she is able to draw the desired fractal. First, select an initial stage cell from the toolbox. The selected cell will be highlighted with a red border. Then, click anywhere in the main drawing area and drag the mouse to another point, and, finally, release the mouse.
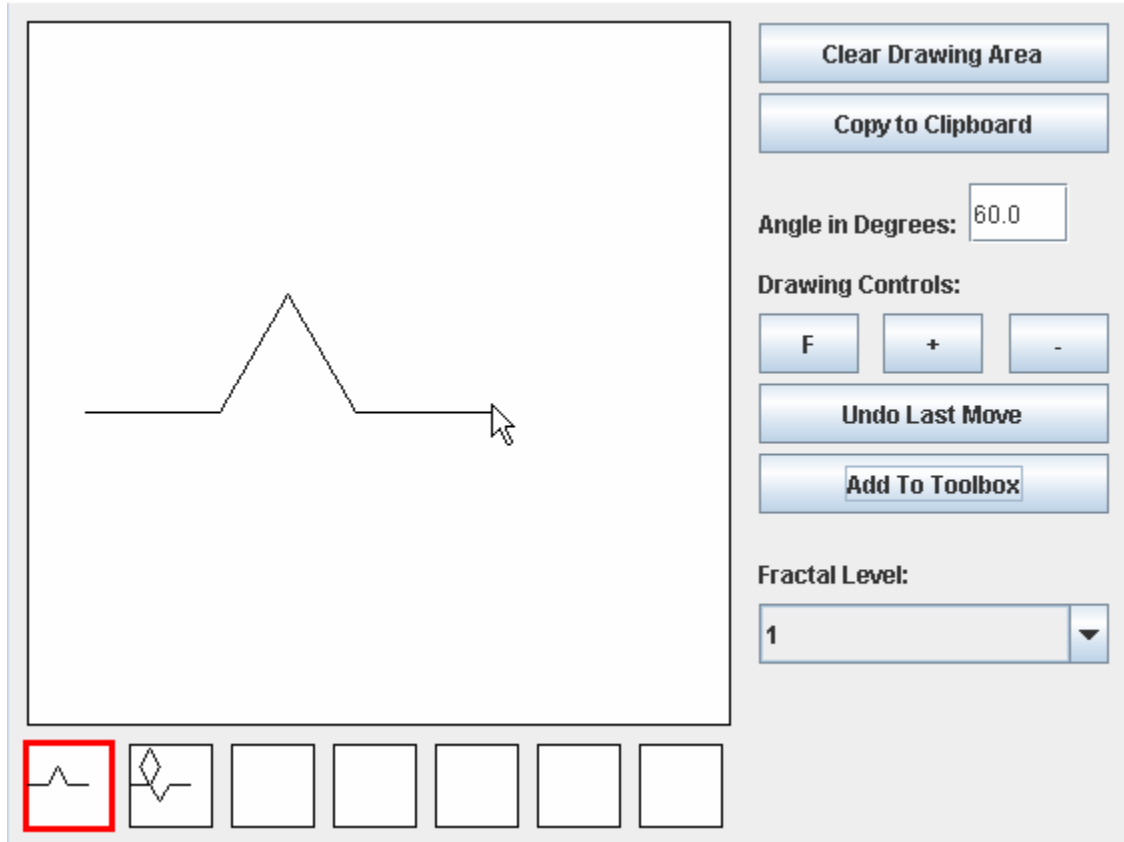
Altering the Fractal Level

The user can alter the level of the fractal by selecting a higher stage from the drop down menu. This can be done either before or after a fractal is already drawn out on the drawing area. If a fractal is already drawn, changing the fractal level will change the fractal that is currently displayed. If the fractal level is changed before a fractal is drawn, the fractal will initially be shown in stage 1 as it is being drawn, but after the mouse is released, the image will change to the correct fractal level.
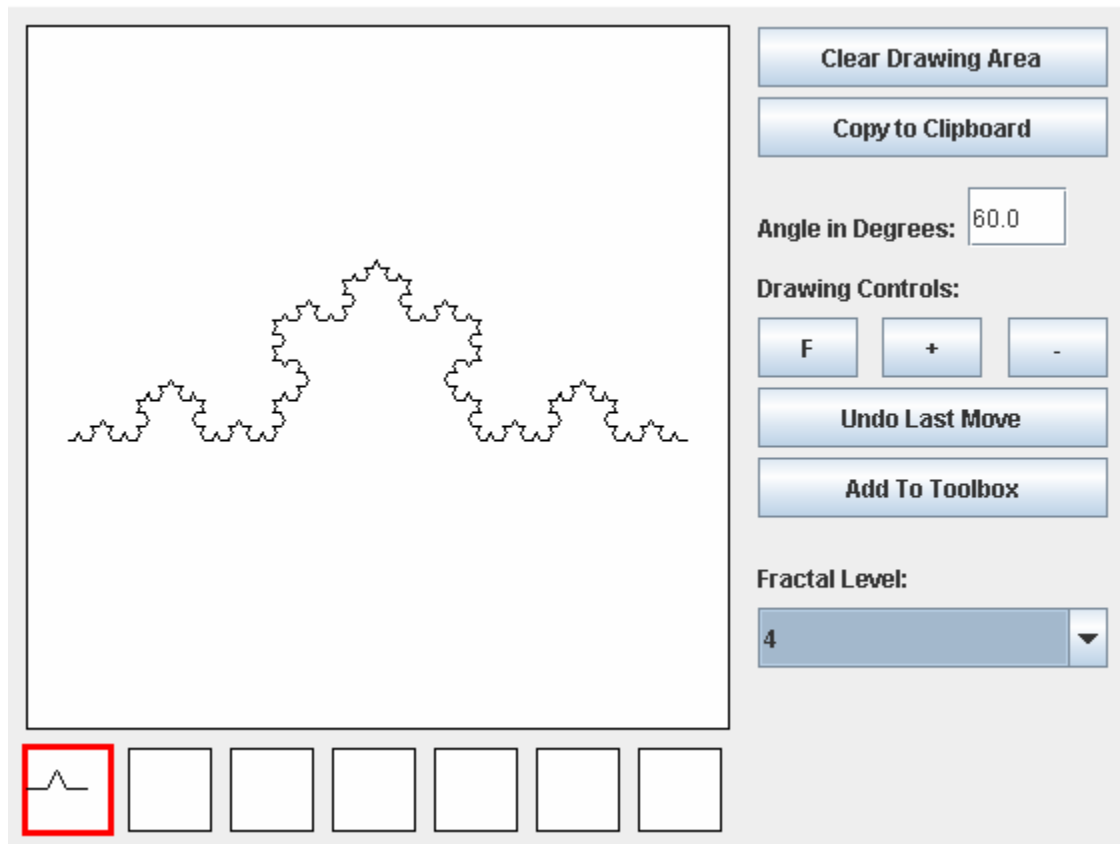
Clearing the Drawing Area

To clear the main drawing area, click "Clear Drawing Area".

Copying the Fractal to the Clipboard

The next point of interest is the "Copy to Clipboard" button. This button's actions are only usable in the stand-alone JAR executable, and not the Web page. By clicking this button, a copy of the created fractal is automatically copied to the system clipboard. The image can then be pasted into a number of programs, such as Microsoft Word, Paint, or Adobe Photoshop. Note, simply clicking "Copy to Clipboard" will not save the image anywhere, it is up to the user to save the image.