More on POV-Ray Scripting

Let's build a diamond

Simple Diamond Program

```plaintext
#declare diamond = sphere (<0,0,0>, 1)
#declare counter = 0;
#while (counter < 7)
    #declare diamond = intersection {
        object {diamond}
        object { plane (<0,0,1>,0)
            rotate <45,0,0>
            translate <0,-1,0>
            rotate <0, counter*360/7,0>
        }
    }
    #declare counter = counter + 1;
#end
```

What about remaining facets?
Example: Grass

```plaintext
#declare counter = 0;
#while ( counter < 30 )
  #declare rx = rand(rpos);
  #declare rz = rand(rpos);
  object {Blade translate <rx,0,rz>}
  #declare counter = counter + 1;
#end
```

What about:

```plaintext
#declare rx = rand(rpos);
#declare rz = rand(rpos);
#declare RandomBlade =
  object {Blade translate <rx,0,rz>}
#declare counter = 0;
#while ( counter < 30 )
  object {RandomBlade}
  #declare counter = counter + 1;
#end
```

Repetition of similar code: Macros

```plaintext
#macro ( parameters )
  body of macro
#end
```
Example: Grass

```
#declare rpos = seed(1);
#macro MakeBlade ()
  #declare rx = rand(rpos);
  #declare rz = rand(rpos);
  object {Blade translate <rx,0,rz> }
#end

#declare counter = 0 ;
#while ( counter < 30 )
  MakeBlade ()
  #declare counter = counter + 1;
#end
```

With Parameters

```
#macro MakeBlade (x1,z1,x2,z2)
  #declare rx = x1+(x2-x1)*rand(rpos);
  #declare rz = z1+(z2-z1)*rand(rpos);
  object {Blade translate <rx,0,rz> }
#end

#declare counter = 0 ;
#while ( counter < 100 )
  MakeBlade (0,0,-5,5)
  #declare counter = counter + 1;
#end
```

Exercises

Blade

- modify density distribution

Create lawn

- make_blade(x,y): create blade at x,y
- create blades at regular intervals in a given area x1,y1, x2,y2
- add positional jitter to blades
- add random rotation
- change color randomly
Exercises: Diamond

Write macro that takes as input
- Cutting Angle
- Number of revolutions
- Distance from center

Diamond

What about Recursion?
What about Recursion?

Fractal Nature

http://www.clarku.edu/research/access/physics/blatt/blattD2.shtml

Fractal Nature

http://solomonsmusic.net/fracmus.htm
Fractal Nature

http://nodens.physics.ox.ac.uk/~oi/Album2/Oxford/treefract.jpg

Fractals

http://abyss.uoregon.edu/~js/cosmo/lectures/lec18.html

Fractal Dimensions

http://www.iemar.tuwien.ac.at/modul23/Fractals/pages/221rugged.html
Fractals

Self-similarity

http://abyss.uoregon.edu/~js/cosmo/lectures/lec18.html

Exercise: Sierpinski Gasket

http://www.mveneman.demon.nl/mcorner/trees/trees.htm

Trees

http://www.mveneman.demon.nl/mcorner/trees/trees.htm
Recursive Tree

make_tree
    build trunk
make_tree
make_tree
...
make_tree
scale/position trees as branches of trunk

Our Tree

![Image of a tree]

others: splinetree

![Image of another tree]

Dave Green, Fall 2003

others: POV-tree

Sybil Santos, Fall 2003
http://home.covad.net/~gobukhov/povtree.html

others: maketree

Wengqian Wu, Fall 2003
http://www.syrials.com/ressources/english/sources27.htm