

NAME

hilbert2d – generate Hilbert curve data for POV-Ray.

SYNOPSIS

hilbert2d [*options*]

DESCRIPTION

the **hilbert2d** utility generates regular, stand-alone include files for the Persistence of Vision Raytracer (POV) program, where every file declares a single *sphere_sweep* which traces a 2D Hilbert curve of a given length.

for details of the structure of the include file, its optional argument and the visible (ie "declare"d) identifiers, see section INCLUDE FILE below.

the *sphere_sweep* primitive is described in POV's manual section 3.4.5.1.13.

invoked without any arguments, the program generates an all-defaults curve length 2^6 laid out in the X-Z plane, to <stdout>.

OPTIONS

-a filename

the content of the file named in the auxiliary option is inserted in the *sphere_sweep* data, without any processing or verification, immediately after the "tolerance" keyword (if given). this allows the inclusion of "[OBJECT MODIFIERS]", as shown in section 3.4.5.1.13 in the POV documentation.

-D creates a simple demo/test scene for the include data generated. the file name is the same as the include file's, with "_demo.pov" appended. the option is ignored if the include data is not written to file.

note that, unlike include files, existing demo scenes will be overwritten.

-d N.N sets the default diameter of the *sphere_sweep* envelope, the default is 0.26. the value can be changed from within in the scene, with a declaration before the curve is "#include"d. see section INCLUDE FILE below.

-h outputs an usage and options summary, then exits.

-N x | y | z

selects the normal, that is, the axis which is at a right angle to the curve. the default is "y", ie the curve spreads along the "x" and "z" axes.

-n N the program generates Hilbert curves which are always 2^N units long, the *length* argument provides the value of N, the range is: $2 \leq N \leq 24$. the default is "6", that is, a length of 64, covering 8x8 units (unscaled).

-o name[.inc]

creates an include file suitable for a given POV version. if omitted, the default extension will be added to name. the file must not already exist.

-P N.N specify the POV version to use in the include file. currently "3.5" is the minimum and any version below "4.0" can be requested, the default is "3.7".

-p name

specify a prefix to prepend to the visible, declared identifiers; up to 17 characters in length. the default is "hc2d_".

-r N specify a value to start the random number generator (RNG) sequence, the number must be a non-zero integer. the return value of the *time*(2) function is used by default.

-S linear | b | cubic

select the type of spline used for the *sphere_sweep*, the default is "linear".

the program only checks/compares the first letter of the argument.

- s <x,y,z> | N.N
scale the curve by the given amount(s). the argument is either a regular POV three-element vector, or a single value to be used for all axes. the default is "<1,1,1>", ie no scaling. see option -translate and section NOTES below.
- T N.N adds a sphere_sweep "tolerance" modifier to the output.
- t <x,y,z> | N.N
an offset added to every data point, ie the curve's origin. as with -scale, the argument can be either a vector or a value. the default is "<0,0,0>", ie no translation.
- V outputs the program version, then exits.
- v outputs a summary of the values used to generate the data (file), including the RNG seed value.
- w N relocates each sphere by up to a given distance, randomly, ie "warping" the curve a little. the limit N is supplied as a percentage, range 1,...,100. the default is not to warp.

note that small(er) percentages can have a significant impact on the time to complete, typically adding 50% plus.

since most, if not all, shells use the angle brackets in their respective syntax, vector arguments given to -scale and -translate must be escaped or quoted.

the argument to the -Normal and -Spline options must be in lowercase.

the space between an option switch and its argument is optional.

INCLUDE FILE

every generated include file has a few globally visible identifiers, all of which begin with the same prefix. the default prefix is "hc2d_". this section lists the default names for a curve of length "6", the numeric part will always be in the range 2,...,24. while the default diameter of the sweep envelope is set at the time of creation, an optional argument allows scene files to change the value "at run-time".

hc2d_sweep_n6

the identifier for a sphere_sweep (of length 6). this is the curve's name, for use in some "object {..}" statement etc.

hc2d_sweep_n6_begin, hc2d_sweep_n6_end

two identifiers which expand to a three-element vector each, the start point of the curve and its end point, respectively.

these values are fixed and will not change when you transform "hc2d_sweep_n6" in the scene subsequently.

hc2d_sweep_n6_include_temp

the identifier guarding against multiple inclusions of the same file.

hc2d_sweep_n6_arg_diameter

the name of the (numeric) argument which can be used to change the diameter of the sphere_sweep envelope. this "override" does not exist until you declare it. if used, it must be declared in the calling scene before the corresponding "#include".

EXIT STATUS

a return value of zero indicates success, anything else is an error and is accompanied by a descriptive message which, except for usage errors, will be (file)system-related.

NOTES

the file name argument to the -outfile option should be simple, excluding directory paths, because it gets embedded in the include file for the "View_POV_Include_Stack" debug display, as well as in the demo scene code.

the program has not been "bullet-proofed" in the sense that care must be taken when supplying arguments.

for example, giving a "-p123_" prefix argument is perfectly legal but will cause POV to choke on generated names like "123_sweep_n*".

the demo/test scene is **very** basic, and the settings work only really with default values. in particular when scaling or translating, or changing the normal, and for longer curves, the camera location and look_at vectors will need to be adjusted, and perhaps the light_source.

BUGS

there is no feedback until the program finishes.

the file names of the *-Demo* scenes tend to be longer than the 14 characters guaranteed by POSIX.

duplication of any of the options on the command-line, bar *-Demo* and *-verbose*, is an error. however, the resulting error messages are confusing because they are the same as the messages shown for the corresponding illegal or out-of-range values.

due to some faulty wiring in the author's brain, the capitalisation of sentences' initial letters, as required in standard English, is absent.

should you find a bug, please let me know, address below.

EXAMPLE

this example shows the necessary adjustment to the *-Demo* scene, which colours **every** curve in red, to use an user supplied texture instead. after creating a file with the "[OBJECT MODIFIERS]" required (here just a different colour), add it via *-auxiliary* to the include file data.

```
$ cat objmod.txt
texture {pigment {Green}}
$ hilbert2d -D -o example -a objmod.txt
wrote 'example.inc', and demo scene.
$ sed -i -re '/Red/s,pigment \{ Red \},,' example.inc_demo.pov
$ povray +a0.3 +w800 +h600 +iexample.inc_demo.pov
```

deleting the default texture ("pigment { Red }") from the scene will render the curve with its "native" texture, in green. if you prefer to use your editor to modify the demo scene file, delete from the second to last line.

SEE ALSO

povray(1).

KEYWORDS

Hilbert curves, Persistence Of Vision Raytracer, POV utility.

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