



ATI STREAM COMPUTING SAMPLE

Mandelbrot

1 Overview

1.1 Location `$(ATISTREAMSDKSAMPLESROOT)\samples\opengl\cl\app`

1.2 How to Run See the *Getting Started* guide for how to build samples. You first must compile the sample.

Use the command line to change to the directory where the executable is located. The pre-compiled sample executable is at `$(ATISTREAMSDKSAMPLESROOT)\samples\opengl\bin\x86\` for 32-bit builds, and `$(ATISTREAMSDKSAMPLESROOT)\samples\opengl\bin\x86_64\` for 64-bit builds.

Type the following command(s).

1. Mandelbrot
This sorts an array of 64 randomly generated numbers.
2. Mandelbrot -h
This prints the help file.

1.3 Command Line Options Table 1 lists, and briefly describes, the command line options.

Table 1 Command Line Options

Short Form	Long Form	Description
-h	--help	Shows all command options and their respective meaning.
-q	--quiet	Quiet mode. Suppresses all text output.
-e	--verify	Verify results against reference implementation.
-v	--verbose	Verbose output.
-t	--timing	Print timing.
-x	--width	Width of problem domain.
-y	--height	Height of problem domain.
-z	--depth	Depth of problem domain.
-s	--scale	Scaling factor to generate the Mandelbrot fractal.
	--device	Devices on which the program is to be run. Acceptable values are <code>cpu</code> or <code>gpu</code> .

2 Implementation Details

The Mandelbrot set is a set of points in the complex plane, the boundary of which forms a fractal. A detailed description of the Mandelbrot fractals is given in reference [1]. The pseudo code to generate the Mandelbrot fractal is also available there. This is parallelized over the pixel value generated using at this pixel just depends on the position of the pixel. The following loop is run on each pixel of the fractal image being rendered.

```
{
  x0 = x co-ordinate of pixel
  y0 = y co-ordinate of pixel

  x = 0
  y = 0

  iteration = 0
  max_iteration = 1000

  while ( x*x + y*y <= (2*2) AND iteration < max_iteration )
  {
    xtemp = x*x - y*y + x0
    y = 2*x*y + y0

    x = xtemp

    iteration = iteration + 1
  }

  if ( iteration == max_iteration )
  then
    color = black
  else
    color = iteration
  plot(x0,y0,color)
}
```

3 References

1. http://en.wikipedia.org/wiki/Mandelbrot_set

Contact

Advanced Micro Devices, Inc.
One AMD Place
P.O. Box 3453
Sunnyvale, CA, 94088-3453
Phone: +1.408.749.4000

For Stream Computing:

URL: www.amd.com/stream
Questions: streamcomputing@amd.com
Developing: [ATI_Stream_SDK_Help_Request](#)
Forum: www.amd.com/streamdevforum



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