ATI STREAM COMPUTING SAMPLE

Mandelbrot

1 Overview

1.1 Location

`$(ATISTREAMSDKSAMPLESROOT)\samples\opencl\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 `$(ATISTREAMSDKSAMPLESROOT)\samples\opencl\bin\x86\` for 32-bit builds, and `$(ATISTREAMSDKSAMPLESROOT)\samples\opencl\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 cpu or gpu.

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

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