image_processing_examples user manual

Title	image_processing_examples
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Source	https://github.com/nkkav/image_processing_examples
Website	http://www.parallelpoints.com (original version)
	http://www.nkavvadias.com (fork)

1. Introduction

This is a collection of image processing primitives in the form of VHDL packages. The packages provide support for reading and writing PNM (PBM, PGM, PPM) image files. The main use of `image_processing_examples` is expected to be as part of testbench code for rapidly testing and validating concepts of image processing IP.

This README is part of Nikolaos Kavvadias' forked version which is available at: https://github.com/nkkav/image_processing_examples

In order to visualize PNM files, the public domain `Imagine` viewer is good choice: http://www.nyam.pe.kr/

Reference documentation for this project can be found in the top-level directory of the distribution in plain text, HTML and PDF form.

2. File listing

The `image_processing_examples` or IPE (ipe) distribution includes the following files. Added files or directories are marked with an *A* while modified files/directories are marked within an *M*. Files removed compared to the original version are marked as *R*. All original files in the pre-fork version are copyright of Martin J. Thompson.

/ipe	Top-level directory
A AUTHORS	List of authors.
A LICENSE	License agreement (2-clause MIT/BSD license).
A README.rst	This file.
A README.html	HTML version of README.
A README.pdf	PDF version of README.

A rst2docs.sh	Bash script for generating the HTML and PDF versions of README.
/ipe/hdl	VHDL code for packages and testbenches
doit	Bash script for running GHDL on pgm.vhd package and testbench.
A feep_16.pgm	24x7 test PGM image with 16 grey levels.
A j_ascii.pbm	6x10 test PBM image showing the capital letter J.
M libv.vhd	Helper package with various definitions including a positive logic `assert` (`assert_equal`). Moved sample testbench to separate file.
A pbm.vhd	`pbm` package for reading/writing PBM images.
M pgm.vhd	`pgm` package for reading/writing PGM images. Moved sample testbench to separate file.
A ppm.vhd	`ppm` package for reading/writing PPM images.
A rgb.ppm	Sample 4x2 ASCII PPM image.
A tb_libv.mk	GHDL Makefile for testing the `libv` package.
A tb_libv.sh	Bash script for running the GHDL simulation for the `tb_libv.vhd` testbench.
A tb_libv.vhd	Bash script for running the GHDL simulation for the `tb_libv.vhd` testbench.
A tb_pbm.mk	GHDL Makefile for testing the `pbm` package.
A tb_pbm.sh	Bash script for running the GHDL simulation for the `tb_pbm.vhd` testbench.
A tb_pbm.vhd	Bash script for running the GHDL simulation for the `tb_pbm.vhd` testbench. Generates the `test_write.pbm` image.
R tb_pgm	Executable for pgm.vhd (incl testbench) generated by GHDL.
A tb_pgm.mk	GHDL Makefile for testing the `pgm` package.
A tb_pgm.sh	Bash script for running the GHDL simulation for the `tb_pgm.vhd` testbench.
A tb_pgm.vhd	Bash script for running the GHDL simulation for the `tb_pgm.vhd` testbench. Generates the `test_write.pgm` image.
A tb_ppm.mk	GHDL Makefile for testing the `ppm` package.
A tb_ppm.sh	Bash script for running the GHDL simulation for the `tb_ppm.vhd` testbench.
A tb_ppm.vhd	Bash script for running the GHDL simulation for the `tb_ppm.vhd` testbench. Generates the `test_write.ppm` image.
A tb_ppm_tpat.mk	GHDL Makefile for testing the `ppm` package by generating a test pattern image.
A tb_ppm_tpat.sh	Bash script for running the GHDL simulation for the `tb_ppm_tpat.vhd` testbench.

A tb_ppm_tpat.vhd	Bash script for running the GHDL simulation for the `tb_ppm_tpat.vhd` testbench. Generates the `test_write_tpat.ppm` image.
A test_write.pbm	8x8 ASCII PBM image generated by `tb_pbm.vhd`.
A test_write.pgm	8x8 ASCII PGM image generated by `tb_pgm.vhd`.
A test_write.ppm	8x8 ASCII PPM image generated by `tb_ppm.vhd`.
A tpat_write.pbm	320x240 test pattern ASCII PPM image generated by `tb_ppm_tpat.vhd`.
A testimage.pbm	8x4 binary PBM test image.
testimage.pgm	8x4 binary PGM test image.
A testimage.ppm	8x4 binary PPM test image.
A testimage_ascii.pbm	8x4 ASCII PBM test image.
testimage_ascii.pgm	8x4 ASCII PGM test image.
testimage_ascii.ppm	8x4 ASCII PPM test image.
/ipe/high_level	High-level (MATLAB) code for various image processing algorithms
corners.m	MATLAB code invoking Shi-Tomasi and generating a PNG image.
edge_compare_noisy.m	Applies either a Sobel or a simple edge detector.
edges.m	Applies vertical and horizontal edge filter and produces PNG images for the intermediate and final results.
shi_tomasi.m	Applies the Shi-Tomasi method to an image data structure.
try_edge_mask.m	Similar to edges.m, tests edge masks.
try_edge_mask.sci	Scilab version of the above.

3. Simulation

The `image_processing_examples` testbenches can be run using the supplied GNU Makefiles and Bash shell scripts using the GHDL simulator. simulation.

3.1. GHDL

For running the GHDL simulation, change directory to the `/hdl` subdirectory:

```
$ cd $IPE_HOME/hdl
```

assuming `IPE_HOME` is the directory where the top-level `/ipe` is found.

Then, the corresponding shell script is executed, e.g. for producing a PPM test image:

```
$ ./tb_ppm.sh
```

The simulation reads the `testimage_ascii.ppm` PPM image file and writes a new image file to `test_write.ppm`.

3.2. Modelsim

Scripts for running an Exemplar/Mentor Modelsim simulation may be added in the future.

4. Synthesis

The `pbm/pgm/ppm` and `libv` package code is not expected to synthesize using logic synthesis tools. Its main purpose is for rapid exploration of image processing primitives in testbench code.

5. Prerequisities

- Standard UNIX-based tools (tested with gcc-4.6.2 on MinGW/x86).
  - make
  - bash (shell)

  For this reason, MinGW (http://www.mingw.org) or Cygwin (http://sources.redhat.com/cygwin) are suggested, since POSIX emulation environments of sufficient completeness.
- GHDL simulator (http://ghdl.free.fr) or Modelsim (http://www.model.com). The latest GHDL distribution (0.29.1, Windows version) also installs GTKwave on Windows.

6. Contact

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