

Ciratefi demonstration programs, v1.06

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1 Modifications

Version 1.06 was compiled using OpenMP for parallel processing.

2 Introduction

File Ciratefi.zip contains improved pyramidal Ciratefi demonstration programs and example image files. Ciratefi (Circular, Radial and Template-Matching Filter) is a template matching technique invariant to rotation, scale, translation, brightness and contrast. Ciratefi was defined in papers [Ci22, Ri13]. An example of Ciratefi input/output is depicted in Fig. 1.

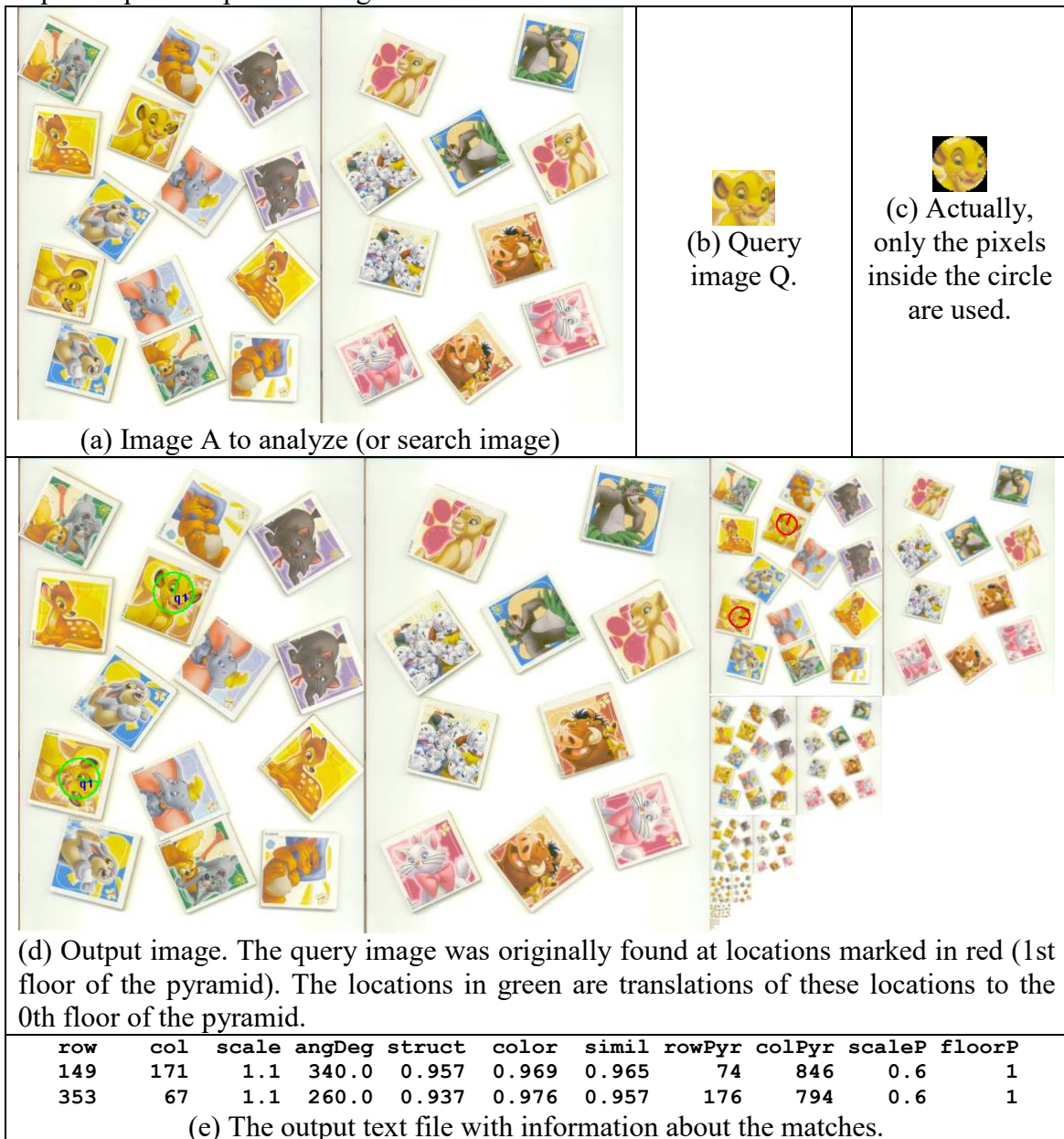


Figure 1: An example of Ciratefi input-output files.

3 Installation

The programs require Windows 10. Probably, they will run correctly also in Windows 8.

1) Uncompress `ciratefi.zip` in a directory, say, `c:\ciratefi`, keeping the subdirectory structure.

2) Edit “path” environment variable to append `c:\ciratefi\bin`. In Windows7, you can do this:

MS-explorer → my computer → properties → advanced → environment variables where you must edit path to *append* `c:\ciratefi\bin`.

4 Installation test

Open a command prompt. In some directory, write `cirategs` or `ciratecs`:

```
c:\directory>cirategs
```

The following prompt must appear:

```
CirateGS: Piramidal ciratefi for grayscale images v1.06
  Written for OpenMP (parallel processing).
CirateGS cirategs.cfg [a.pgm q.pgm ci.ppm]
  If [a.pgm q.pgm ci.pgm] are specified, overrides cirategs.cfg
Error: Invalid number of arguments
```

5 Running the examples

5.1 Running an example

Go to `c:\ciratefi\linstance` and run:

```
c:\ciratefi\linstance>ciratecs ciratecs-linstance.cfg a2.jpg q01.ppm c201.ppm
```

This command will search for `q01.ppm` in image `a2.jpg` and write the output in `c201.ppm`.

5.2 Intermediary files

Many intermediary files are generated:

ga.tga: Gaussian filtered search image (a2.jpg)
gq.tga: Gaussian filtered query image (q01.ppm)
actualq.tga: Only the pixels inside the circle are used.
a.avi: Circular (ring) projections of ga.tga
cq.tga: Circular (ring) projections of gq.tga
cp.tga: Cifi's output and Rafi's input.
1st degree candidate pixels in color.
Embedded scale parameter.
cm.tga: Cifi's output and Rafi's input.
1st degree candidate pixels in color.
Embedded Cifi's color similarity measure.
rq.tga: Radial projection of gq.tga.
rp.tga: Rafi's output and Tefi's input.
2nd degree candidate pixels in color.
Embedded scale and rotation parameters.
rm.tga: Rafi's output and Tefi's input.
2nd degree candidate pixels in color.
Embedded Rafi's color similarity measure.
tp.tga: Tefi's output.
Matching pixels in color.
Embedded scale and rotation parameters.
tm.tga: Tefi's output.
Matching pixels in color.
Embedded color similarity measure.
c201.ppm: The output image with circle and pointer.
p.txt: The output text file.

5.3 Configuration file

You can change Ciratefi parameters by editing `ciratecs-1instance.cfg`. The parameters the user should know to fine-tune the search are:

```
pct_cand_1f=2.0
// Percentage of first grade candidates in relation to the total number of
// pixels of A. If you increase this parameter, the program will run slower, but
// the probability of missing the template decreases. If you want to find more
// than one instance of the query image, you should increase this parameter.

pct_cand_2f=1.0
// Percentage of second grade candidates in relation to the total number of
// pixels of A. If you increase this parameter, the program will run slower, but
// the probability of missing the template decreases. If you want to find more
// than one instance of the query image, you should increase this parameter.

qtd_cand_3f=1
// The number of objects to be detected. For example, if qtd_cand_3f=4, the
// program will return 4 locations in search image A most similar to the query
// image Q.

dist_pixel_3f=0
// The minimal distance between two matching pixels. For example, if
// dist_pixel_3f=20, there cannot be two matchings separated by less than 20
// pixels. For example, if qtd_cand_3f=2 and dist_pixel_3f=0, the program can
// return two neighboring pixels as the two matchings.

ssalpha=0.01 // Weight of brightness.
ssbeta=0.01  // Weight of contrast. Do not set to zero.
ssgama=0.49 // Weight of "structure" or correlation
ssdelta=0.49 // Weight of color or chromaticity
```

```
// You can change the weights assigned to brightness, contrast, structure and color differences.
```

5.4 Output files

The program marks in red the location where the template was found in the output image. If the template was not found on the 0-th floor of the scale pyramid, then the program marks in green the corresponding location on the 0-th floor.



The output text file is p.txt (unless you have changed its name in the configuration file):

row	col	scale	angDeg	struct	color	simil	rowPyr	colPyr	scaleP	floorP
239	409	1.0	90.0	0.961	0.945	0.957	119	844	0.5	1

Row, *column*, *scale* and *angle_degrees* returns the localization of the template on the 0-th floor of the scale pyramid. *Angle_degrees* measures the angle starting at 12 hour and rotates counterclockwise.

Struct, *color* and *similarity* returns the similarity measure. They all ranges from 0 to 1. *Struct* is the normalized correlation of the grayscale image. *Color* is the similarity of coloration. *Similarity* is a ponderation between struct, color, brightness and contrast (the last two measures are not written in the output file).

Row_pyramid, *column_pyramid*, *scale_pyramid* and *floor_pyramid* are the location of the matching on the floor>0 of the scale pyramid. This is the original location where the template was found.

5.5 *Running the batches*

You can run the tests by calling the batch files:

```
C:\ciratefi\1instance>runc (color tests)
```

```
C:\ciratefi\1instance>rung (grayscale tests)
```

```
C:\ciratefi\2instances>runc (color tests)
```

```
C:\ciratefi\2instances>rung (grayscale tests)
```

Note: Converting the query image `c:\ciratefi\1instance\q14.ppm` to grayscale, it becomes an image with almost constant grayscale. So, Cirategs fails to find this query image.

6 **Recompiling the source programs**

1) Install Cekeikon v5 as described in:

<http://www.lps.usp.br/hae/software>

2) The following commands should recompile the programs

```
c:\ciratefi\src>compila ciratecs -pv -omp
```

```
c:\ciratefi\src>compila cirategs -pv -omp
```

7 **References**

[Ci22] H. Y. Kim and S. A. Araújo, "Grayscale Template-Matching Invariant to Rotation, Scale, Translation, Brightness and Contrast," *IEEE Pacific-Rim Symposium on Image and Video Technology, Lecture Notes in Computer Science*, vol. 4872, pp. 100-113, 2007.

[Ri13] S. A. Araújo and H. Y. Kim, "Ciratefi: An RST-Invariant Template Matching with Extension to Color Images," *Integrated Computer-Aided Engineering*, vol. 18, no. 1, pp. 75-90, 2011.