Visual Descriptor Applications Documentation

1   Purpose of the Softwares

Visual Descriptor Applications are developed to facilitate the automated extraction (VDE) and matching (VDM) of MPEG-7 Visual Descriptors from images. All 8 image descriptors 1 supported by VDE and can be extracted from whole or parts of images, which means that depending on the existence of a binary mask file, a segmentation mask or a set of bounding box coordinates the extraction mechanism is able to calculate the descriptors either for specific image regions or the entire image. The produced output can be either in xml format or plain text. VDM supports the matching of the same 8 descriptors by getting as input xml files generated by VDE.

Name	Descriptor Code
ScalableColor	SC
DominantColor	DC
ColorLayout	CL
ColorStructure	CST
HomogeneousTexture	HT
EdgeHistogram	EH
ContourShape	CS
RegionShape	RS

Table 1: Supported descriptors and descriptor codes

2   Requirements

VDE is running on Windows and two additional libraries are necessary to operate successfully namely, OpenCV 1.0 and Xerces 2.8. OpenCV is an image processing library and is used for accessing the image content. On the other hand, Xerces is an xml parser used to produce the output files in xml format. The two libraries can be downloaded from `http://opencvlibrary.sourceforge.net/` and `http://xerces.apache.org/xerces-c/`. For VDM only the Xerces library is necessary for xml parsing, since no image loading is performed.

3   Using VDE

The generic syntax for extracting visual descriptors is:

```
vde.exe -d <list_of_descriptor_codes> -i <image>
[-rm <binary_mask> | -rp <region_map> | -rb <bounding_box_file>]
[-o <output>]  [-f <output_file_mode>]
```

-d List of descriptor codes separated with a space.

-i The filename of the input image.

-rm The filename of the binary mask.

-rp The filename of the region map (segmentation mask). A file where the pixels of a region share the same value. Values start from 0 and increment by 1.

-rb The filename of the text file with the list of bounding boxes. This file contains in each line the coordinates for a bounding box separated by comma (upper_left_x,upper_left_y,bottom_right_x,bottom_right_y).

-o The filename of the output file. default: same name as the input image(.xml of .txt).

-f The output file mode. 0: xml file, 1:plain text file, default:xml file. In the plain text mode the descriptor vectors are concatenated and each row contains the vectors of a single region if a segmentation mask is used.

3.1   Examples

```
vde.exe -d EH -i image.jpeg -o out.xml
```

extract a single descriptor (Edge Histogram) globally from an image, output xml file out.xml

```
vde.exe -d DC CL HT -i image.jpeg -rm binarymask.pbm
```

extract a list of descriptors from a single region of an image, output xml file image.xml

```
vde.exe -d CST -i images/image.ppm -rp segmmask.pbm
```

extract a single descriptor from all regions of a segmentation mask, output xml file images/image.xml

```
vde.exe -d HT -i image.png -rb regions.txt -o out.txt -f 1
```

extract a single descriptor from all bounding boxes of a text file, output plain text file out.txt

3.2   Parameter file

A plain text parameter file is used to define the length and contents of some descriptors. The default filename is *parameters.txt* and needs to be in the same folder as the executable file. If not present then the default values are used for each descriptor. An example of the contents of the parameter file is given:

```
/* CL */
NumberOfYCoeff 6
NumberOfCCoeff 3
/* CST*/
ColorQuantSize 256
/* DC */
VariancePresent     0
```

```
SpatialCoherency    1
/* HT */
layer   1
/* SC */
NumberOfBitplanesDiscarded 0
NumberOfCoefficients 256
```

All the possible values for the parameters are given in table 2. The default
values are the ones contained in the example above.

Descriptor	Parameter	Possible Values
CL	NumberOfYCoeff	Y coefficients (3, 6, 10, 15, 21, 28, 64)
	NumberOfACoeff	Y coefficients (3, 6, 10, 15, 21, 28, 64)
SC	NumberOfBitplanesDiscarded	Bit planes discarded (0, 1, 2, 3, 4, 6, 8)
	NumberOfCoefficients	16, 32, 64, 128 or 256
DC	VariancePresent	Calculate or not (0, 1)
	SpatialCoherency	Calculate or not (0, 1)
CST	ColorQuantSize	Descriptor size (32, 64, 128 or 256)
HT	layer	Standard deviation calculated or not (0,1)

Table 2: Parameters for each descriptor

4   Using VDM

The generic syntax for matching visual descriptors is:

```
vdm.exe -d <list_of_descriptor_codes> -n1 <input file a>
-n2 <input file b> -o <output>
```

-d List of descriptor codes separated with a space.

-n1 The filename of the first input xml file.

-n2 The filename of the second input xml file.

-o The filename of the output plain text file with the distances.

4.1   Examples

```
vdm.exe -d EH -n1 test1.xml -n2 test2.xml -o out.txt
```

calculate the distance for a single descriptor between test1.xml and test2.xml.
The output file would be out.txt containing the distance.

```
vdm.exe -d CL CST EH -n1 test1.xml -n2 test2.xml -o out.txt
```

calculate the distances for a list of descriptors between test1.xml and test2.xml.
The output file would be out.txt containing the distances, one in each line.

5   Contact

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