**Running and building the MPEG-7 XM software – MPEG110 Release**

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# Linux

The MPEG-7 XM software was tested on Linux Ubuntu 12.04 LTS, gcc version 4.6.3.

External libraries can be installed directly from the Software Center, and no compilation is needed. The libraries are: libxerces-c3.1, libxerces-c-dev, imagemagick, libmagick++-dev. Some of the descriptors also need the following libraries: libcv‑dev, libqhull-dev. To install the libraries use the Software Center or type the command for each library:

sudo apt-get install “package-name”

For Part 4 Audio tools, external library AFsp is needed and must be built from source. It can be downloaded from: <http://www-mmsp.ece.mcgill.ca/Documents/Downloads/AFsp/AFsp-v5r2.tar.gz>. Put the library in the same directory as the main MPEG-7 source directory and change the directory name for this library to *afsp* (or edit the Makefile to set different name). The library can be built with command *make*. If audio tools are not needed this library can be switched-off in the MPEG-7 XM Makefile by setting USEAFSP=n.

The main MPEG-7 XM directory contains Makefile. Edit the Makefile to activate/deactivate different options. Some of the options may not work in the current version, so they were deactivated. The software was built using shared libraries (STATIC=n). The individual descriptors can be activated/deactivated in the Makefile by setting the respective variable to “y” or “n”. The external libraries can be also activated/deactivated, the variables of the Makefile corresponding to the external libraries are: USEXML, USEXML3, USEMAGICK, USEAFSP, USEOPENCV, USEQHULL. The following variables can be set to “n” if the descriptors using the corresponding external libraries are also deactivated: USEAFSP (Audio descriptors), USEOPENCV (Image/VideoSignature, Perceptual3DShape), USEQHULL (Perceptual3DShape).

To build the software just type in the main source directory of MPEG-7 XM:

*make*

*sudo make install*

The software will be installed in the default location:

/usr/local/bin – the main binary file.

/usr/local/shared – shared libraries.

This location can be changed in the *Makefile*. The following command may be needed to activate the created shared libraries:

sudo ldconfig

To run the XM software just type (it will print command line parameters, for example of usage see the section: *Example of running the MPEG-7 XM*):

*XMMain.exe*

# Windows

## Building external libraries

**ImageMagick v 6.8.9, Xercesc v 3.1.1, OpenCV v 2.4.8, AFsp v5r2**

The description refers to Visual Studio 2010. The software was also successfully build on Visual Studio 2013.

### ImageMagick

The correct version with windows support should be downloaded, e.g.:

<http://www.imagemagick.org/download/windows/ImageMagick-6.8.9-5.7z> or from any mirror at: <http://www.imagemagick.org/script/download.php>. The versions with implemented windows support are usually placed in subdirectory *windows* of the mirror sites. The Windows version of ImageMagick contains subdirectory *VisualMagick*. The software was tested with ImageMagick versions 6.8.8, 6.8.9.

The building steps are described in *Install-windows.txt* in the main directory of ImageMagick package. The steps include:

* Open MS Visual Studio configure solution: *ImageMagick-6.8.9\VisualMagick\configure\configure.sln* and building the project. This project may need to be upgraded to the correct Visual Studio version.
* Run the program *configure.exe* which was built in the previous step.
* Perform steps of the creator which appears, in the creator:
  + **Uncheck “Exclude deprecated methods in Magick Core API”**, this is necessary as MPEG-7 XM use some functions which are marked as depreciated in the new version of ImageMagick, and which are excluded by default.
  + “**Build type setup”** should be the default “Dynamic Muli-threaded DLL runtimes”.
* The creator will generate Windows solution: *VisualMagick\VisualDynamicMT.sln*. Open and build *Release* and *Debug* versions (the projects may need to be upgraded to the correct Visual Studio version).
* Rename the directory *ImageMagick-6.8.9* to *ImageMagick* (it should be located in the same directory as the main MPEG-7 XM directory *src*. Alternatively, instead of renaming the directory name, create link: *mklink /J ImageMagick ImageMagick-6.8.9*).

### Xerces-C++

* Download Xerces-C++ source from: <http://ftp.ps.pl/pub/apache//xerces/c/3/sources/xerces-c-3.1.1.zip> (or use other download page: <http://xerces.apache.org/mirrors.cgi>)
* Open the correct Visual Studio project, for VS2010 it is: *xerces-c-3.1.1\projects\Win32\VC10\xerces-all\xerces-all.sln*, and build the library (project named *XercesLib*).
* Rename the directory *xerces-c-3.1.1* to *xml* (it should be located in the same directory as the main MPEG-7 XM directory *src*. Alternatively, instead of renaming the directory name, create link: mklink /J xml xerces-c-3.1.1).

Note: the separate projects included in MPEG-7 XM which also uses Xerces-C++ library are AccessUnit, navigation\_path, TextualAccess\_Encoder. They have been excluded from the Visual Studio project list. These programs implement some functionality of MPEG-7 part 1 (Systems) of the standard. They were not updated to the new Xerces-C++ library and the building of the projects fails (they can still be built using old Xerces-C++ version 1.6.0).

### OpenCV

This library is used in 3 descriptors: Perceptual3DShape, ImageSignature, VideoSignature.

Modifications of the MPEG-7 XM:

* Download OpenCV version 2.4.8 (there is newer version which should work but may need updating the VS projects) from: <http://opencv.org/downloads.html> (OpenCV for Windows). Unpack, and rename to *opencv* and place in the same folder as MPEG-7 XM directory *src*.
* The package contains a bundle of a few versions of Windows binaries (VS2010, VS2011, VS2012, 32-bit and 64-bit). The path to the VS2010 32-bit version of libraries has been chosen: opencv\build\x86\vc10.
* The following DLL files should be in the execution path: opencv\_core248.dll, opencv\_imgproc248.dll, , opencv\_legacy248.dll, opencv\_video248.dll, opencv\_ml248.dll, opencv\_highgui248.dll, opencv\_flann248.dll, opencv\_features2d248.dll, opencv\_calib3d248.dll

### AFsp

(For audio descriptors)

* Download AFsp library from: <http://www-mmsp.ece.mcgill.ca/Documents/Downloads/AFsp/AFsp-v5r2.tar.gz> and:
* Open file AFsp-v5r2\MSVC\MSVC.dsw in Visual Studio. This contains old project files, accept conversion to new version of Visual Studio. Build two libraries: libAO, libtsp.
* Rename the directory AFsp-v5r2 to AFsp (it should be located in the same directory as the main MPEG-7 XM directory *src*. Alternatively, instead of renaming the directory name, create link: mklink /J AFsp AFsp-v5r2).

## Visual Studio 2013

The software was successfully built (after upgrading projects and rebuilding the libraries) using Visual Studio 2013. The following libraries should be built as described in the previous section: ImageMagick v 6.8.9, Xercesc v 3.1.1, AFsp v5r2. For OpenCV use the same package as for VS 2010.

2013 MFC MBCS DLL Add-on is required and should be installed in the system (it is used by ImageMagick configure program):

<http://www.microsoft.com/en-us/download/details.aspx?id=40770>

(Direct link: <http://go.microsoft.com/?linkid=9832071>)

## Building and running MPEG-7 XM

Open MPEG-7 XM solution file XMWinExe\XMWinExe.sln in the MPEG-7 XM source tree. Build the solution. The main project is XMMainExe. The executable is XMMainExe.exe. In addition the following tools are created: mpeg2decode.exe, mpeg2enc.exe, xmpg2enc.exe. These tools are used for some video descriptors.

The following DLL files are needed to run the XMMainExe.exe program. They may be copied from the output directories of the external libraries to a directory where they be found by the loader (e.g. to the same directory as the main MPEG-7 XM executable). The list includes ImageMagick DLLs for JPEG/GIF/PNM decoding, **additional ImageMagick DLL files may be needed for other image formats**.

The ImageMagick DLL files can be found in: *ImageMagick\VisualMagick\bin*.

The Xerces-C++ DLL file can be found in: *xml\Build\Win32\VC10\Release*.

The OpenCV DLL files can be found in: *opencv\build\x86\vc10\bin*.

IM\_MOD\_RL\_jpeg\_.dll

IM\_MOD\_RL\_pnm\_.dll

IM\_MOD\_RL\_gif\_.dll

CORE\_RL\_magick\_.dll

CORE\_RL\_lqr\_.dll

CORE\_RL\_glib\_.dll

CORE\_RL\_lcms\_.dll

CORE\_RL\_jpeg\_.dll

CORE\_RL\_bzlib\_.dll

CORE\_RL\_ttf\_.dll

CORE\_RL\_zlib\_.dll

opencv\_legacy248.dll

opencv\_calib3d248.dll

opencv\_features2d248.dll

opencv\_video248.dll

opencv\_highgui248.dll

opencv\_imgproc248.dll

opencv\_ml248.dll

opencv\_flann248.dll

opencv\_core248.dll

xerces-c\_3\_1.dll

# Creating the Descriptor Documentation

In the directories Doc/Video, Doc/Audio and Doc/MDS there is for each Descriptor or Description Scheme a .txt file. From these files it is possible to create an html based descriptor documentation. For this purpose:

* change to the Doc directory

> cd Doc

* run (perl interpreter need to be installed on the system)

> perl format\_all.pl . .

* open the file Doc/html/index.html in html browser.

# Example of running the MPEG-7 XM for ColorStructure descriptor

The MPEG-7 XM software is a command line tool, which can run on Windows or on Linux system. It supports many descriptors. For most of the descriptors there are two modes of operations called applications: extraction called server applications and searching called client applications. The list of supported descriptors/applications can be listed by the following command (Windows):

***XMWinExe.exe –a PrintApplications***

On Linux type:

***XMMain.exe –a PrintApplications***

The main MPEG-7 XM source directory contains many files with extensions “.bat”. The files containing “X” after the names of the descriptors contain commands for the extraction (server applications), while files containing “S” after the names of the descriptors contain commands for search (client applications). The program is controlled with parameters given from the command line, or parameters specified in a parameter file given in the command line. The parameters given in the command line override the parameters from parameter file if both are specified.

See the example of *ColorStructureX.bat, ColorStructureS.bat*, change the name of the program to the Windows version *XMWinExe.exe* or Linux version *XMMain.exe*, edit the command line options and the corresponding parameter file *Parfiles/ColorStructure256xml.par*.

Edit/change parameters in file ***Parfiles/ColorStructure256xml.par.*** It contains the following parameters:

***Application ColorStructureClient***

/\* the default application is “Client” of ColorStructure descriptor, which means searching – this can be overridden in the command line \*/

***ListFile Databases/ccd.lst***

/\* The path to the image list. The image list should contain a list of images separated with newlines. Create file *Databases/ccd.lst* (or other file specified as *ListFile*) with paths to images (format JPEG or other format supported by ImageMagick, but the ImageMagick DLL for that format should be present in the path of the program loader). The image path can be full path or relative path (relative to the working directory of *XMWinExe.exe/XMMain.exe*\*/

***NoOfMatches 20***

/\* The number of search results printed by the search application. \*/

***Bitstream Bitstreams/ColorStructure256.xml***

/\* The path to the output file. It will contain the extracted descriptors. Note that the directory containing the output descriptors must exist before extraction is started (here the directory is "Bitstreams"). \*/

**ColorQuantSize 256**

/\* The parameter file can contain parameters specific to descriptors. Here is specified parameter for color quantization size of ColorStructure descriptor \*/

***CodingMode 0***

/\* The format of output descriptors, two formats are supported: 0 – XML, 2 – binary (raw binary descriptors are produced, BiM is not supported) \*/

To extract the descriptors for the provided list of images run the following command (modified *ColorStructureX.bat*):

***XMWinExe.exe -p Parfiles/ColorStructure256xml.par -a ColorStructureServer***

The options from the parameter file specified with “-p” are used. The application *ColorStructureClient* specified in the parameter file is overridden with the command line option “*–a ColorStructureServer*”.

To perform the search for the provided list of images and the extracted descriptors run the command (modified *ColorStructureS.bat*):

***XMWinExe.exe -p Parfiles/ColorStructure256xml.par -q image.jpg***

The application is *ColorStructureClient* specified in the parameter file. The *image.jpg* is the query image specified with option “*-q*”. The list of results containing images with the corresponding distances to the query image descriptor will be printed to the standard output.

To see the list of command line parameters run the software without any parameters:

***XMWinExe.exe***

The output is the following:

*call XM with:*

*XMMain.exe -pParameterfile -aApplication -lListfile -bBitstream -qQuery -nNoOfMatches -rLogRedirection -oResultRedirection*

*Parameterfile = parameter file for application()*

*Application = selected XM-application()*

*Listfile = file with list of filenames of database()*

*Bitstream = MPEG-7 bitstream ()*

*Query = filename of query ()*

*NoOfMatches = size of list with best matches (0)*

*LogRedirection = file where all the log messeges are going to ()*

*ResultRedirection= file where all the results are going to ()*