**INTERNATIONAL ORGANISATION FOR STANDARDISATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

**ISO/IEC JTC1/SC29/WG11**

**CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC1/SC29/WG11 MPEG2016/m37625**

**February 2016, San José, CA, US**

|  |  |
| --- | --- |
| **Source** | Samsung |
| **Status** | Input Document |
| **Title** | HDR-VQM Reference Code and its Usage |
| **Author** | K. Pachauri, S. Sahota (Samsung) |

**Abstract:**

# In 113th meeting of MPEG in Geneva, Oct 2015, a newer metric, HDR-VQM, for HDR quality estimation is introduced [1]. This contribution provides description of HDR-VQM reference s/w and its parameters, and its usage. Source code is released to MPEG.

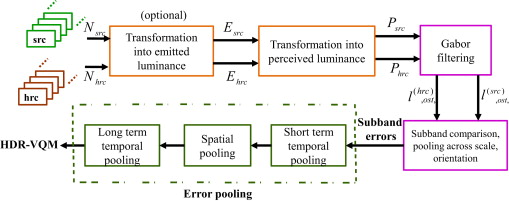
**Introduction:**

MPEG has released a Call for Evidence (CfE) related to HDR and WCG video coding [3]. Several video quality metrics have been considered for use within codec development to evaluate the quality improvement of CfE proposals.

HDR-VQM is based on signal pre-processing, and a frequency based decomposition of the HDR video and metric pipeline is described in figure below from [2].

**puEncode**

**calcLogGabor**



**longTermPooling**

**biCubic(1920x1080🡪896x512)**

**spatioTemporalPooling**

**adaptDisplay**

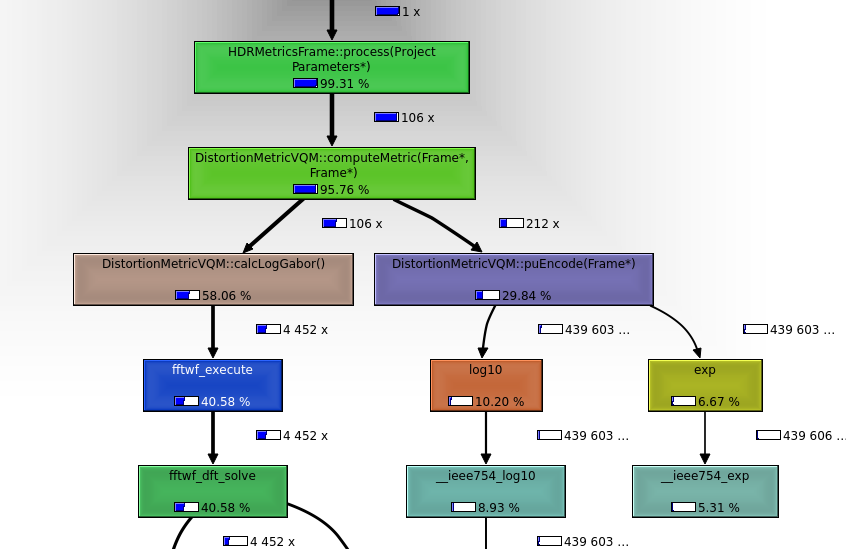
Mapping of all HDR-VQM blocks to DistortionMetricVQM class functions is shown in above figure.

**Reference code:**

HDR-VQM calculation is integrated in HDRTools (0.10) provided by MPEG. Main code is implemented in

* 0.10/common/src/DistortionMetricVQM.cpp
* 0.10/common/inc/DistortionMetricVQM.h.

For gabor filtering FFTW [4] library is used and provided with s/w package for windows build for both x86/x64. For linux, FFTW need to be downloaded and following instruction need to be followed before building HDRTools.



**HDR-VQM Callgraph**

Most of complexity of HDR-VQM is in calculating log gabor filters and PU encoding.

**Windows Builds:**

* Open 0.10\HDRTools.sln and build the code
* Copy "libfftw3f-3.dll" to the bin folder
  + "libfftw3f-3.dll" is inside 0.10\fftw-3.3.4-dll32 for x86 (Win32)
  + "libfftw3f-3.dll" is inside 0.10\fftw-3.3.4-dll64 for x64 (Win64)

**Linux Builds:**

* **Instructions to install fftw library:** 
  + Download fftw-3.3.4.tar.gz from [4]
  + tar zxf fftw-3.3.4.tar.gz
  + cd fftw-3.3.4
  + ./configure --enable-float
  + make
  + make install (need administrative permission)
* make

**To run the HDR-VQM calculation:**

./HDRMetrics -f HDRMetrics.cfg -f Sequence.cfg

Sample config files (HDRMetrics.cfg, Sequence.cfg) are in bin folder of HDRTools.

**HDR-VQM Parameters:**

Pool\_perc=0.3 # Pooling percentage for calculation of HDRVQM

Max\_Display=4500.0 # Maximum luminance that can be displayed

Min\_Display=0.03 # Minimum luminance that can be displayed

Fixation\_Time=0.6 # Fixation Duration in seconds for calculation of spatio-temporal tubes

Area\_Display=6100 # Display Area

Rows\_Display=1080 # Display Rows

Cols\_Display=1920 # Display Columns

Viewing\_Dist=178 # Viewer's distance from the display in centimetres

NumberOfScales=5 # No. of scales used for log gabor filters

NumberOfOrientations=4 # No. of scales used for log gabor filters

DisplayAdapt=0 # 1: Enable linear display adaptation, 0: No display adaptation

**Results:**

**** ****



**Anchor32 Vs ETM Mode 0**

**References**

**[1]** S. Sahota, K. Pachauri “Preliminary Study on HDR-VQM for HDR/WCG Compression Solutions,” document ISO/IEC JTC1/SC29/WG11 MPEG2015/ m37418, 113th MPEG meeting, October 2015, Geneva, CH

[**2]** M. Narwaria, M. P. Da Silva, and P. Le. Callet, “HDR-VQM: An Objective Quality Measure for High Dynamic Range Video", Signal Processing: Image Communication, 2015.

**[3]** A. Luthra, E. Francois and W. Husak, “Call for Evidence (CfE) for HDR and WCG Video Coding”, Doc. N15083, February 2015, Geneva, Switzerland.

[4] FFTW Library: <http://www.fftw.org/download.html>