Moving Picture Experts Group (MPEG)
of ISO/IEC JTC 1/SC 29/WG 7 Document: MPEG-wXXXXX
April 2022, Online

Title:	V3C/V-PCC test model v18.0 user manual
Status:	Draft
Purpose:	User manual
Author(s):	Julien Ricard | *julien.ricard@interdigital.com*
Source:	3DG

Abstract
This document is a user manual describing usage of reference software for the V3C/V-PCC project. It applies to version 18.0 of the software.

Contents

1 General Information
Reference software is being made available to provide a reference implementation of the V3C standard being developed by MPEG (ISO/IEC JTC 1/SC 29/WG 7). One of the main goals of the reference software is to provide a basis upon which to conduct experiments in order to determine which coding tools provide desired coding performance. It is not meant to be a particularly efficient implementation of anything, and one may notice its apparent unsuitability for a particular use. It should not be construed to be a reflection of how complex a production-quality implementation of a future V3C standard would be.

This document aims to provide guidance on the usage of the reference software. It is widely suspected

to be incomplete and suggestions for improvements are welcome. Such suggestions and general inquiries may be sent to the general MPEG 3DGC email reflector at mpeg-3dgc@gti.ssr.upm.es (registration required).

1.1 Bug reporting

Bugs should be reported on the issue tracker set up at http://mpegx.int-evry.fr/software/MPEG/PCC/TM/mpeg-pcc-tmc2/issues.

2 Obtaining the software

2.1 Clone

The authoritative location of the software is the following git repository: http://mpegx.int-evry.fr/software/MPEG/PCC/TM/mpeg-pcc-tmc2

Each released version may be identified by a version control system tag in the form `release-v18.0` [1].

An example:

```
$ git clone \
   http://mpegx.int-evry.fr/software/MPEG/PCC/mpeg-pcc-tmc2.git
$ cd mpeg-pcc-tmc2
```

> It is strongly advised to obtain the software using the version control system rather than to download a zip (or other archive) of a particular release. The build system uses the version control system to accurately identify the version being built.

2.2 Building

The codec is supported on Linux, OSX and Windows platforms. The build configuration is managed using CMake.

> It is strongly advised to build the software in a separate build directory.

2.2.1 Scripts

Bash scripts can be use to build mpeg-pcc-tmc2 project: - build.sh: build solutions.
- clear.sh: clear solututions (./clear.sh all: to clear dependencies)

2.2.2 OSX

```
$ mkdir build
$ cd build
$ cmake ..
$ cmake --build . --config Release --parallel 8
```

2.2.3 Linux

```
$ mkdir build
$ cd build
$ cmake ..
$ cmake --build . --config Release --parallel 8
```

2.2.4 Windows

```
$ md build
$ cd build
$ cmake ..
$ cmake --build . --config Release --parallel 8
```

2.2.5 External dependencies

According to the CMake options defined in the CMakeLists.txt, the TMC2 required some external dependencies to work:

- USE_JMAPP_VIDEO_CODEC: use JM software to encoder and decoder videos (codecId parameters must be set equal to 0 and the videoEncoderOccupancyPath, videoEncoderGeometryPath and videoEncoderAttributePath but be set the JM applications)
- USE_HMAPP_VIDEO_CODEC: use HM software to encoder and decoder videos (codecId parametesr must be set equal to 1 and the videoEncoderOccupancyPath, videoEncoderGeometryPath and videoEncoderAttributePath but be set the JM applications)

- USE_JMLIB_VIDEO_CODEC: use JM library to encoder and decoder videos (codecId parameter must be set equal to 2)
- USE_HMLIB_VIDEO_CODEC: use HM library to encoder and decoder videos (codecId parameter must be set equal to 3)
- USE_VTMLIB_VIDEO_CODEC: use VTM library to encoder and decoder videos (codecId parameter must be set equal to 4)
- USE_FFMPEG_VIDEO_CODEC: use FFMPEG library to encoder and decoder videos (codecId parameter must be set equal to 5). This mode is only available in the FFMPEG branch.
- USE_SHMAPP_VIDEO_CODEC: use SHM software to encoder and decoder videos (codecId parametesr must be set equal to 6, the videoEncoderGeometryPath and videoEncoderAttributePath using the SHM application, and the videoEncoderOccupancyPath using the HM application)
- USE_HDRTOOLS: use HDRTools to convert the raw video files.

The video encoder softwares and libraries can be found in the corresponding repositories:

- JM: https://vcgit.hhi.fraunhofer.de/jct-vc/JM.git
- HM: https://vcgit.hhi.fraunhofer.de/jvet/HM.git
- VTM: https://vcgit.hhi.fraunhofer.de/jvet/VVCSoftware_VTM.git
- SHM: https://vcgit.hhi.fraunhofer.de/jvet/SHM.git

Some changes have been made on these libraries to allow to use the three libraries at the same time and to increase the codec efficiencies for the V3C contents. the three codecs must be patch with the files:

- JM: dependencies/jm-modification/PCC_JM.patch
- HM: dependencies/hm-modification/pcc_me-ext_and_namespace_for_HM-16.20+SCM-8.8.patch
- VTM: dependencies/vtm-modification/adaptions_for_vtm_11_2.patch

By default according the the CMake options, the dependencies are cloned and patched by the cmake process.

The external dependencies could be downloaded, built and linked independenly.

JM:

```
$ git clone checkout \
    https://vcgit.hhi.fraunhofer.de/jct-vc/JM.git \
    dependencies/jm19.0_lib
$ cd dependencies/jm19.0_lib
$ git patch ../jm-modification/PCC_JM.patch
```

HM:

```
$ git clone checkout \
    https://vcgit.hhi.fraunhofer.de/jvet/HM.git \
    dependencies/HM-16.20+SCM-8.8
$ cd dependencies/HM-16.20+SCM-8.8
$ git patch ../hm-modification/\
            pcc_me-ext_and_namespace_for_HM-16.20+SCM-8.8.patch
```

VTM:

```
$ git clone checkout \
    https://vcgit.hhi.fraunhofer.de/jvet/VVCSoftware_VTM.git \
    dependencies/VTM-11.2
$ cd dependencies/VTM-11.2
$ git patch ../vtm-modification/adaptions_for_vtm_11_2.patch
```

HDRTools:

```
 $ git clone -b 0.17-dev \
```

```
https://gitlab.com/standards/HDRTools.git \
dependencies/HDRTools
```

The pointcloud metrics can be computed inside the TM2 encoder and decoder according to the input parameters: * computeMetrics: Compute metrics * uncompressedDataPath: Input pointcloud to encode. Multi-frame sequences may be represented by %04i * normalDataPath: Input pointcloud to encode. Multi-frame sequences may be represented by %04i * resolution: Specify the intrinsic resolution * dropdups: 0(detect), 1(drop), 2(average) subsequent points with same coordinates * neighborsProc: 0(undefined), 1(average), 2(weighted average), 3(min), 4(max) neighbors with same geometric distance

The computations of the metrics are the same than the distances computed with the pcc_distortion software that can be found in: http://mpegx.int-evry.fr/software/MPEG/PCC/mpeg-pcc-dmetric.git.

3 Structure of the test model

This software consists of mutliple executables and libraries. The two main applications are PccAppEncoder and PccAppDecoder, that are the applications used to encode and decode the point clouds. These software are directly linked to the two main libraries: PccLibEncoder and PccLibDecoder that containe the main encoder and decoder processes. The processes and the data structures used both by encoder and decoder are in the PccLibCommon library. The VPCC bitstreams data structures are defined in library: PccLibBitstreamCommon. The encoder and decoder bitstreamer writing and reading processes are stored in to separate libraries: PccLibBitstreamWriter and PccLibBitstreamReader.

Additional of these two libraries, the virtual wrapper libraries are used to encode video (PccLibVideoEncoder), to decode video (PccLibVideoDecoder) and to perform color conversion of the video streams (PccLibColorConverter). These libraries are wrappers and are used to launch external applications or libraries: HDRTools, HM Encoder/Decoder (TLibEncoder/TLibDecoder). These libraries defined application program interfaces (API) to easyly launch external processesto perform these tasks without change the VPCC source code.

The below figure is the module dependency draph of the VPCC reference software.

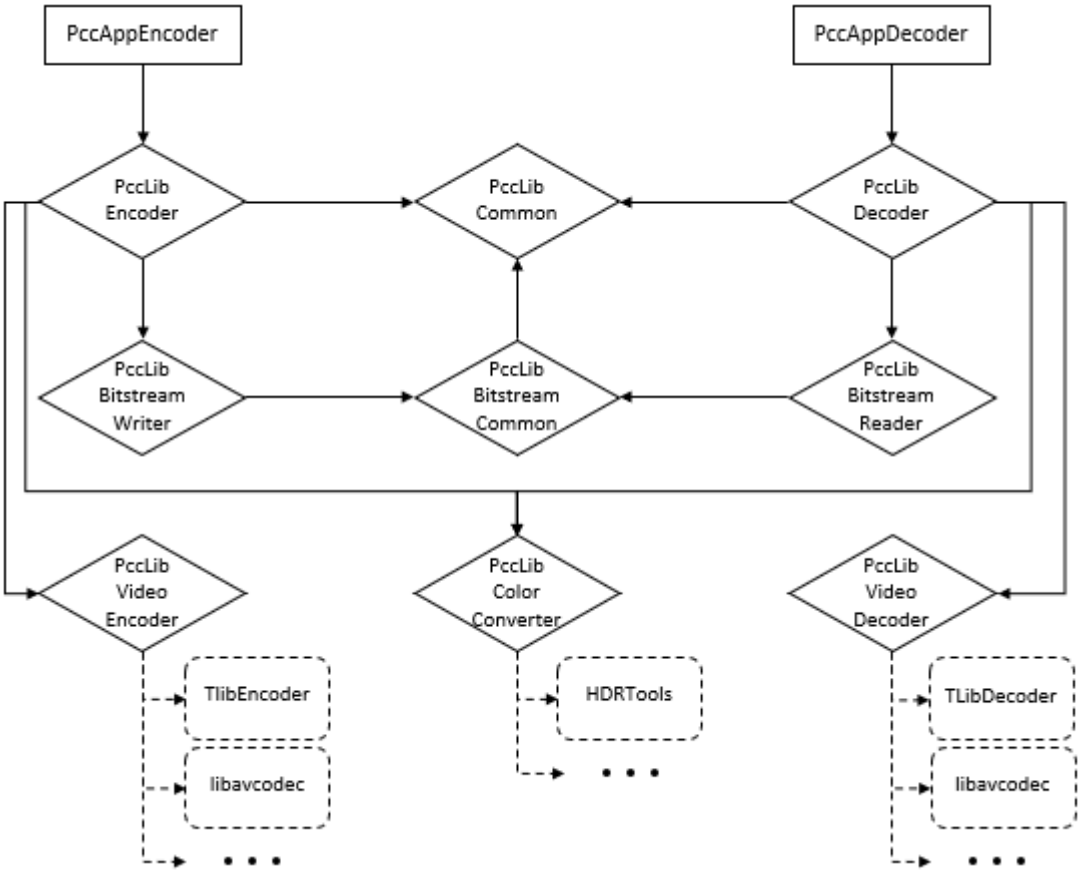

Figure 1 – Structure of the test model

4 Using the codec

```
$ ../bin/PccAppEncoder [--help] [-c config.cfg] [--parameter=value]
$ ../bin/PccAppDecoder [--help] [--parameter=value]
$ ../bin/PccAppMetrics [--help] [--parameter=value]
```

4.1 Principle

The encoder takes as input a PLY file describing a point cloud with integer positions and, optionally, per-point integer colour attributes.

The output of the encoder is a binary bitstream encapsulated using the V3C annex-B format.

Conversely, the decoder takes as input a compressed bitstream file in V3C annex-B format and produces a reconstructed PLY file with position and any present attribute values.

The software may be configured using either command line arguments or from a configuration file specified using the `-c|--config=` option.

Sample configuration files are provided in the cfg/ directory.

Parameters are set by the last value encountered on the command line. Therefore if a setting is set via a configuration file, and then a subsequent command line parameter changes that same setting, the command line parameter value will be used.

4.2 Common test condition configurations

Configuration files are provided in the cfg directory to aid configuring the encoder. The general pattern of usage is illustrated below, where multiple configuration files control different aspects of the test conditions.

NB: parameters set in one configuration file override the same parameter in earlier files. ie. order matters.

Further help text describing option usage is available using "./bin/PccAppEncoder –help" or "./bin/PccAppDecoder

–help”.

4.3 Examples

4.3.1 Encoder

The next command line encodes one streams:

```
$ ./bin/PccAppEncoder \
  --config=./cfg/common/ctc-common.cfg \
  --config=./cfg/condition/ctc-all-intra.cfg \
  --config=./cfg/sequence/queen.cfg \
  --config=./cfg/rate/ctc-r1.cfg \
  --colorTransform=0 \
  --configurationFolder=./cfg/ \
  --uncompressedDataFolder=./People/ \
  --colorSpaceConversionPath=HDRConvert \
  --videoEncoderPath=TAppEncoderHighBitDepthStatic \
  --videoEncoderOccupancyMapPath=TAppEncoderHighBitDepthStatic \
  --compressedStreamPath=./S22C2AI_queen/S22C2AIR01_queen.bin \
  --frameCount=32
```

To compute the metrics in the encode, the normal of the source point cloud must be given to the encoder. The next parameter must be added to the previous command:

```
--normalDataPath=./People/Technicolor/queen_n/frame_%04d_n.ply
```

4.3.2 Decoder

The next command line decodes one streams:

```
$ ./bin/PccAppDecoder \
  --startFrameNumber=0000 \
  --compressedStreamPath=./S22C2AI_queen/S22C2AIR01_queen.bin \
  --reconstructedDataPath=./S22C2AI_queen/S22C2AIR01_queen_dec_%04d.ply \
  --videoDecoderPath=TAppDecoderHighBitDepthStatic \
  --videoDecoderOccupancyMapPath=TAppDecoderHighBitDepthStatic \
  --colorSpaceConversionPath=./external/HDRTools/bin/HDRConvert \
  --inverseColorSpaceConversionConfig=./cfg/hdrconvert/yuv420torgb444.cfg \
  --nbThread=1 \
  --colorTransform=0 \
```

To compute the metrics in the decoder, the normal of the source point cloud and the source PLY must be given to the decoder. The next parameter must be added to the previous command:

```
  --config=./cfg/sequence/queen.cfg \
  --uncompressedDataFolder=./People/ \
  --normalDataPath=./People/Technicolor/queen_n/frame_%04d_n.ply
```

4.3.3 Metrics

PccAppMetrics could be used to test the PccLibMetrics. For CTC experiments, it’s sugested to used mpeg-pcc-dmetrics: http://mpegx.int-evry.fr/software/MPEG/PCC/mpeg-pcc-dmetric.git.

For example, mpeg-pcc-dmetric and PccAppMetric could be used with the next command line:

```
$ ../bin/PccAppMetrics \
  --uncompressedDataPath=longdress_vox10_1051.ply \
  --reconstructedDataPath=./S26C2AIR01_longdress_dec_1051.ply \
  --normalDataPath=./People/8i/longdress_n/longdress_vox10_1051_n.ply \
  --resolution=1023 \
  --frameCount=1

$ ./mpeg-pcc-demetric/test/pc_error \
```

```
  --fileA=./People/8i/8iVFBv2/longdress/Ply/longdress_vox10_1051.ply  \
  --fileB=S26C2AIR01_longdress_dec_1051.ply \
  --inputNorm=./People/8i/longdress_n/longdress_vox10_1051_n.ply \
  --color=1 \
  --resolution= 1023
```

The two softwares give the same results.

4.3.4 Scripts

More examples of running could be found in ./test/runme_linux.sh.

These examples can be start based on your system with the following scripts: * ./test/runme_linux.sh * ./test/runme_windows.bat * ./test/runme_osx.sh

The V3C common test condition (CTC) command lines could be found in ./test/ctc_command_line.sh.

4.3.5 SHVC Information

The SHVC software used in the program can be obtained from the link below:

```
https://hevc.hhi.fraunhofer.de/svn/svn_SHVCSoftware/tags/SHM-12.4/
```

The additional Enhanced Layer will be used by SHVC codec according to the number of entries entered in the SHVCLayer in the encoder. SHVCRateX and SHVCRateY refer to the width and height resolution reduction rate of 2D images of additional layers. The decoder uses the video corresponding to the layer entered into the SHVCLayerID. LID 0 has the lowest density, and if 3 layers are used, LID 2 has the same density as V-PCC TMC2 output. Occupancy Map video encode/decode using same version of HM encooder/decoder.

SHVC Running 3layer PccAppEncoder

```
$ ./bin/PccAppEncoder \
    --configurationFolder=cfg/ \
    --config=cfg/common/ctc-common.cfg \
    --config=cfg/condition/ctc-random-access-svc-3L.cfg \
    --config=cfg/sequence/longdress_vox10.cfg \
    --config=cfg/rate/ctc-r3.cfg \
    --uncompressedDataFolder=Dynamic_Objects/People/ \
    --frameCount=1 \
    --videoEncoderGeometryPath=..\bin\win\TAppEncoder.exe \
    --videoEncoderAttributePath=..\bin\win\TAppEncoder.exe \
    --videoEncoderOccupancyPath=..\bin\win\occupancy\TAppEncoder.exe \
    --colorSpaceConversionPath=../external/HDRTools/bin/HDRConvert \
    --reconstructedDataPath=S26C03R03_rec_%04d.ply \
    --compressedStreamPath=S26C03R03.bin \
    --SHVCLayer=2 \
    --SHVCRateX=2 \
    --SHVCRateY=2
```

SHVC Running 3layer PccAppDecoder

```
$ ./bin/PccAppDecoder \
    --compressedStreamPath=S26C03R03.bin \
    --videoDecoderGeometryPath=..\bin\win\TAppDecoder.exe \
    --videoDecoderAttributePath=..\bin\win\TAppDecoder.exe \
    --videoDecoderOccupancyPath=..\bin\win\occupancy\TAppDecoder.exe \
    --colorSpaceConversionPath=../external/HDRTools/bin/HDRConvert \
    --inverseColorSpaceConversionConfig=cfg/hdrconvert/yuv420torgb444.cfg \
    --reconstructedDataPath=S26C03R03_dec_%04d.ply \
    --SHVCLayerID=2
```

4.4 General options

The next tables shows the parameters of the encoder, decoder and metrics programs.

4.4.1 Encoder parameters

Parameter=Value	Usage
help	This help text
Global	
c—config	Configuration file name
configurationFolder	Folder where the configuration files are stored,use for cfg relative paths.
uncompressedDataFolder	Folder where the uncompress input data are stored, use for cfg relative paths.
uncompressedDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
compressedStreamPath	Output(encoder)/Input(decoder) compressed bitstream
reconstructedDataPath	Output decoded pointcloud. Multi-frame sequences may be represented by %04i
startFrameNumber	First frame number in sequence to encode/decode
frameCount	Number of frames to encode
groupOfFramesSize	Random access period
colorTransform	The colour transform to be applied: 0: none 1: RGB to YCbCr (Rec.709)
colorSpaceConversionPath	Path to the HDRConvert. If unset, an internal color space conversion is used
colorSpaceConversionConfig	HDRConvert configuration file used for RGB444 to YUV420 conversion
inverseColorSpaceConversion Config	HDRConvert configuration file used for YUV420 to RGB444 conversion
videoEncoderPath	HM video encoder executable
videoEncoderAuxPath	HM video encoder executable
videoEncoderOccupancyMapPath	HM lossless video encoder executable for occupancy map
nbThread	Number of thread used for parallel processing
keepIntermediateFiles	Keep intermediate files: RGB, YUV and bin
Encoder	
nnNormalEstimation	Number of points used for normal estimation
gridBasedRefineSegmentation	Use grid-based approach for segmentation refinement
maxNNCountRefineSegmentation	Number of nearest neighbors used during segmentation refinement
iterationCountRefine Segmentation	Number of iterations performed during segmentation refinement
voxelDimensionRefine Segmentation	Voxel dimension for segmentation refinement (must be a power of 2)
searchRadiusRefineSegmentation	Search radius for segmentation refinement
occupancyResolution	Resolution of packing block(a block contain only one patch)
enablePatchSplitting	Enable patch splitting
maxPatchSize	Maximum patch size for segmentation
log2QuantizerSizeX	log2 of Quantization step for patch size X: 0. pixel precision 4.16 as before

log2QuantizerSizeY	log2 of Quantization step for patch size Y: 0. pixel precision 4.16 as before
minPointCountPerCCPatch Segmentation	Minimum number of points for a connected component to be retained as a patch
maxNNCountPatchSegmentation	Number of nearest neighbors used during connected components extraction
surfaceThickness	Surface thickness
depthQuantizationStep	minimum level for patches
maxAllowedDist2RawPoints Detection	Maximum distance for a point to be ignored during raw points detection
maxAllowedDist2RawPoints Selection	Maximum distance for a point to be ignored during raw points selection
lambdaRefineSegmentation	Controls the smoothness of the patch boundaries during segmentation refinement
minimumImageWidth	Minimum width of packed patch frame
minimumImageHeight	Minimum height of packed patch frame
maxCandidateCount	Maximum nuber of candidates in list L
occupancyPrecision	Occupancy map B0 precision
occupancyMapConfig	Occupancy map encoder config file
occupancyMapQP	QP for compression of occupancy map video
enhancedOccupancyMapCode	Use enhanced-delta-depth code
EOMFixBitCount	enhanced occupancy map fixed bit count
occupancyMapRefinement	Use occupancy map refinement
postprocessSmoothingFilterType	Exclude geometry smoothing from attribute transfer
flagGeometrySmoothing	Enable geometry smoothing
neighborCountSmoothing	Neighbor count smoothing
radius2Smoothing	Radius to smoothing
radius2BoundaryDetection	Radius to boundary detection
thresholdSmoothing	Threshold smoothing
patchExpansion	Use occupancy map refinement
gridSmoothing	Enable grid smoothing
gridSize	grid size for the smoothing
thresholdColorSmoothing	Threshold of color smoothing
cgridSize	grid size for the color smoothing
thresholdColorDifference	Threshold of color difference between cells
thresholdColorVariation	Threshold of color variation in cells
flagColorSmoothing	Enable color smoothing
thresholdColorPreSmoothing	Threshold of color pre-smoothing
thresholdColorPreSmoothing LocalEntropy	Threshold of color pre-smoothing local entropy
radius2ColorPreSmoothing	Redius of color pre-smoothing
neighborCountColorPreSmoothing	Neighbor count for color pre-smoothing
flagColorPreSmoothing	Enable color pre-smoothing
bestColorSearchRange	Best color search range
numNeighborsColorTransferFwd	Number of neighbors creating Fwd list
numNeighborsColorTransferBwd	Number of neighbors creating Bwd list
useDistWeightedAverageFwd	Distance weighted average for Fwd list
useDistWeightedAverageBwd	Distance weighted average for Bwd list
skipAvgIfIdenticalSourcePoint PresentFwd	Skip avgeraging if target is identical to a Fwd point
skipAvgIfIdenticalSourcePoint	Skip avgeraging if target is identical to a

PresentBwd	Bwd point
distOffsetFwd	Distance offset to avoid infinite weight
distOffsetBwd	Distance offset to avoid infinite weight
maxGeometryDist2Fwd	Maximum allowed distance for a Fwd point
maxGeometryDist2Bwd	Maximum allowed distance for a Bwd point
maxColorDist2Fwd	Maximum allowed pari-wise color distance for Fwd list
maxColorDist2Bwd	Maximum allowed pari-wise color distance for Bwd list
excludeColorOutlier	Exclude color outliers from the NN set
thresholdColorOutlierDist	Threshold of color distance to exclude outliers from the NN set
geometryQP	QP for compression of geometry video
attributeQP	QP for compression of attribute video
geometryConfig	HM configuration file for geometry compression
geometry0Config	HM configuration file for geometry D0 compression
geometry1Config	HM configuration file for geometry D1 compression
attributeConfig	HM configuration file for attribute compression
attribute0Config	HM configuration file for attribute D0 compression
attribute1Config	HM configuration file for attribute D1 compression
rawPointsPatch	Enable raw points patch
noAttributes	Disable encoding of attributes
attributeVideo444	Use 444 format for attribute videos
useRawPointsSeparateVideo	Compress raw points with video codec
attributeRawSeparateVideoWidth	Width of the MP's attribute in separate video
geometryMPConfig	HM configuration file for raw points geometry compression
attributeMPConfig	HM configuration file for raw points attribute compression
absoluteD1	Absolute D1
absoluteT1	Absolute T1
multipleStreams	number of video(geometry and attribute) streams
qpT1	qp adjustment for T1 0, +3, -3...
qpD1	qp adjustment for D1 : 0, +3, -3...
constrainedPack	Temporally consistent patch packing
levelOfDetailX	levelOfDetail : X axis in 2D space (should be greater than 1)
levelOfDetailY	levelOfDetail : Y axis in 2D space (should be greater than 1)
groupDilation	Group Dilation
offsetLossyOM	Value to be assigned to non-zero occupancy map positions
thresholdLossyOM	Threshold for converting non-binary occupancy map to binary
prefilterLossyOM	Selects whether the occupany map is prefiltered

	before lossy compression (default=false)
patchColorSubsampling	Enable per patch color sub-sampling
maxNumRefAtalsList	maximum Number of Reference Patch list, default: 1
maxNumRefAtlasFrame	maximum Number of Reference Atlas Frame per list, default: 1
pointLocalReconstruction	Use point local reconstruction
mapCountMinus1	Numbers of layers (rename to maps?)
singleMapPixelInterleaving	Use single layer pixel interleaving
removeDuplicatePoints	Remove duplicate points(
surfaceSeparation	surface separation
highGradientSeparation	Separate high gradient points from a patch
minGradient	Minimun gradient for a point to be separated
minNumHighGradientPoints	Minimum number of connected high gradient points to be separated from a patch
packingStrategy	Patches packing strategy(0: anchor packing, 1(default): flexible packing, 2: tetris packing)
useEightOrientations	Allow either 2 orientations (0(default): NULL AND SWAP), or 8 orientation (1)
safeGuardDistance	Number of empty blocks that must exist between the patches (default=1)
attributeBGFill	Selects the background filling operation for attribute only (0: patch-edge extension, 1(default): smoothed push-pull algorithm), 2: harmonic background filling
lossyRawPointsPatch	Lossy raw points patch(0: no lossy raw points patch, 1: enable lossy raw points patch (default=0)
minNormSumOfInvDist4MPSelection	Minimum normalized sum of inverse distance for raw points selection: double value between 0.0 and 1.0 (default=0.35)
lossyRawPointPatchGeoQP	QP value for geometry in lossy raw points patch (default=4)
globalPatchAllocation	Global temporally consistent patch allocation.(0: anchor's packing method(default), 1: gpa algorithm, 2: gtp algorithm)
globalPackingStrategyGOF	Number of frames to pack globally (0:(entire GOF))
globalPackingStrategyReset	Remove the reference to the previous frame (0(default), 1)
globalPackingStrategyThreshold	matched patches area ratio threshold (decides if connections are valid or not, 0(default))
patchPrecedenceOrder	Order of patches
lowDelayEncoding	Low Delay encoding (0(default): do nothing, 1: does not allow overlap of patches bounding boxes for low delay encoding)
geometryPadding	Selects the background filling operation for geometry (0: anchor, 1(default): 3D geometry padding)
apply3dMotionCompensation	Use auxilliary information for 3d motion

	compensation.(0: conventional video coding, 1: 3D motion compensated)
geometry3dCoordinatesBitdepth	Bit depth of geomtery 3D coordinates
geometryNominal2dBitdepth	Bit depth of geometry 2D
nbPlrmMode	Number of PLR mode
patchSize	Size of Patch for PLR
enhancedProjectionPlaneUse	Enhanced Projection Plane(0: OFF, 1: ON)
minWeightEPP	Minimum value
additionalProjectionPlaneMode	additiona Projection Plane Mode 0:none 1:Y-Axis 2:X-Axis 3:Z-Axis 4:All-Axis 5:apply to portion
partialAdditionalProjectionPlane	The value determines the partial point cloud. It's available with only additionalProjectionPlaneMode(5)
enablePointCloudPartitioning	
roiBoundingBoxMinX	
roiBoundingBoxMaxX	
roiBoundingBoxMinY	
roiBoundingBoxMaxY	
roiBoundingBoxMinZ	
roiBoundingBoxMaxZ	
numTilesHor	
tileHeightToWidthRatio	
numCutsAlong1stLongestAxis	
numCutsAlong2ndLongestAxis	
numCutsAlong3rdLongestAxis	
mortonOrderSortRawPoints	
pbfEnableFlag	enable patch block filtering
pbfFilterSize	pbfFilterSize
pbfPassesCount	pbfPassesCount
pbfLog2Threshold	pbfLog2Threshold
Metrics	
computeChecksum	Compute checksum
computeMetrics	Compute metrics
normalDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
resolution	Specify the intrinsic resolution
dropdups	0(detect), 1(drop), 2(average) subsequent points with same coordinates
neighborsProc	0(undefined), 1(average), 2(weighted average), 3(min), 4(max) neighbors with same geometric distance

4.4.2 Decoder parameters

Parameter=Value	**Usage**
help	This help text
Global	
c,config	Configuration file name
compressedStreamPath	Input

	compressed bitstream
reconstructedDataPath	Output decoded pointcloud. Multi-frame sequences may be represented by %04i
startFrameNumber	Fist frame number in sequence to encode/decode
colorTransform	The colour transform to be applied: 0: none 1: RGB to YCbCr (Rec.709)
colorSpaceConversion Path	Path to the HDRConvert. If unset, an internal color space conversion is used
inverseColorSpaceConversion Config	HDRConvert configuration file used for YUV420 to RGB444 conversion
videoDecoderPath=	HM video decoder executable
videoDecoderOccupancyMap Path	HM lossless video decoder executable for occupancy map
nbThread	Number of thread used for parallel processing
keepIntermediateFiles	Keep intermediate files: RGB, YUV and bin
testLevelOfDetail Signaling	Disable patch sampling resolution scaling; use in conjunction with same parameter in encoder
patchColorSubsampling	Enable per-patch color up-sampling
Metrics	
computeChecksum=1	Compute checksum
computeMetrics=1	Compute metrics
uncompressedDataFolder	Folder where the uncompress input data are stored, use for cfg relative paths.
startFrameNumber	Fist frame number in sequence to encode/decode
frameCount	Number of frames to encode
groupOfFramesSize	Random access period
uncompressedDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
reconstructedDataPath	Output decoded pointcloud. Multi-frame sequences may be represented by %04i
normalDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
resolution	Specify the intrinsic resolution
dropdups	0(detect), 1(drop), 2(average) subsequent points with same coordinates
neighborsProc	0(undefined), 1(average), 2(weighted average), 3(min), 4(max) neighbors with same geometric distance
nbThread	Number of thread used for parallel processing
minimumImageHeight	Ignore parameter

flagColorPreSmoothing	Ignore parameter
surfaceSeparation	Ignore parameter
Conformance	
checkConformance	Check conformance
path	Root directory of conformance files and prefix: S26C03R03_
level	Level indice
fps	Frame per second

4.4.3 Metrics parameters

Parameter=Value	**Usage**
help	This help text
computeChecksum	Compute checksum
computeMetrics	Compute metrics
startFrameNumber	Fist frame number in sequence to encode/decode
frameCount	Number of frames to encode
uncompressedDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
reconstructedDataPath	Output decoded pointcloud. Multi-frame sequences may be represented by %04i
normalDataPath	Input pointcloud to encode. Multi-frame sequences may be represented by %04i
resolution	Specify the intrinsic resolution
dropdups	0(detect), 1(drop), 2(average) subsequent points with same coordinates
neighborsProc	0(undefined), 1(average), 2(weighted average), 3(min), 4(max) neighbors with same geometric distance
nbThread	Number of thread used for parallel processing
minimumImageHeight	Ignore parameter
flagColorPreSmoothing	Ignore parameter
surfaceSeparation	Ignore parameter

5 References

- [1] “Common Test Conditions for PCC”, ISO/IEC JTC1/SC29/WG07 MPEG/N00038, Jul. 2020, Online.
- [2] “V-PCC Test Model v18”, ISO/IEC JTC1/SC29/WG07 MPEG/N00311, Apr. 2022, Online.