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1 Introduction

The CD text of Carriage of Timed Metadata Metrics of Media in the ISO Base Media File Format [1] has been issued at the 107th MPEG meeting. This contribution is proposing sample entry and sample formats definition for Timed Metadata Metrics, which were missing in the CD text.

2 Carriage of Timed Metadata Metrics within the ISO Base Media File Format

2.1 General

Timed metadata metrics are carried as metadata tracks within ISO Base Media File Format. Metadata Metrics are classified by type and each type is given a code name which is used as sample entry name. There may be one or more metric types under a specific type of metadata. Different metadata metric types and corresponding storage formats are identified by their unique coding names.

2.2 Sample Entry for Quality Metrics

The sample entry name is the code name used to differentiate metadata type. In the sample entry, the metrics that are present in each sample and the constant field size that is used for the values, are indicated.

```
aligned(8) class QualityMetricsSampleEntry(metadata_type)
   extends SampleEntry (metadata_type){
   unsigned int(8) field_size_bytes;
   unsigned int(8) metric_count;
   for (i = 1 ; i <= metric_count ; i++){
      unsigned int(32) metric_code;

   }
}
```

Each sample is an array of metrics values, corresponding one for one to the declared metrics. Each value is padded by preceding zero bytes, as needed, to the number of bytes indicated by field_size_bytes.
A metadata track is linked to the track it describes by means of a ‘cdsc’ (content describes) track reference.

2.3 Sample Entry for Green Metrics

The sample entry name is the code name used to differentiate metadata type. In the sample entry, the metric that is present in each sample, the number of entries that are present for this metric and the constant field size that is used for the values are indicated.

```
aligned(8) class GreenMetricsSampleEntry(metadata_type)
   extends SampleEntry (metadata_type){
   unsigned int(8) field_size_bytes;

   unsigned int(8) num_entries;
   unsigned int(32) metric_code;
}
```

Each metric is composed of a list of couples of values, whose number of elements is indicated by `num_entries`. Each value is padded by preceding zero bytes, as needed, to the number of bytes indicated by `field_size_bytes`.
A metadata track is linked to the track it describes by means of a 'cdsc' (content describes) track reference.

2.4 Sample Entry names

The coding name for video quality information is 'vqme'. Some commonly used video quality metrics are defined in the specification; see section 3.
The coding name for bitrate information is 'brme'.
The coding name for Green Video Metadata information is 'gvme'. The metrics used are defined in section 4

2.5 Sample Format for Quality Metric

Quality Metric samples format respects the following syntax :

```
aligned(8) class QualityMetricSample(){
for (i = 1 ; i <= metric_count ; i++){
   unsigned int(field_size_bytes * 8) value;

   }
}
```

`metric_count`: shall take the value of metric count contained in the sample entry.
`value`: indicates the value measured in the metric in the order it appears in the sample entry.

2.6 Sample Format for Green Metric

Green Metric samples format respects the following syntax :

```
aligned(8) class GreenMetricSample(){
for (i = 1 ; i <= num_entries ; i++){
      unsigned int(field_size_bytes * 8) x_value;
      unsigned int(field_size_bytes * 8) y_value;
      }
}
```

`num_entries` : shall take the value of num entries contained in the sample entry.
`x_value`: indicates the first value of each element in the metric
`y_value`: indicates the second value of each element in the metric
Note : `y_value` can be a function of `x_value`

3 Video quality measurement and metrics

Refer to CD text of Carriage of Timed Metadata Metrics of Media in the ISO Base Media File Format [1]

4 Green Metadata metrics

4.1 Decoder-Power Reduction metric

4.1.1 Definition

The Decoder-Power Reduction metric is defined in the CD of ISO/IEC 23001-11 - Energy-Efficient Media Consumption (Green Metadata) [2]. It provides decoder complexity reduction ratios for the media track that the metadata track refers to by means of 'cdsc' reference.

4.1.2 Metric name

The Decoder-Power Reduction sample shall be provided under the 'depr' metric name.

4.1.3 Sample storage format

Decoder-Power Reduction sample format is given in 2.6.

`dec_op_reduc_ratio_from_max` value shall be stored as an unsigned 8-bit integer value into the x_value field.

`shift_dec_op_reduc_ratio_from_prev` value shall be stored as an unsigned 16-bit integer value into the y_value field.

`dec_op_reduc_ratio_from_max` value will be padded to an unsigned 16-bit integer value for each Green Metric sample.

num_entries can be set to 1 if only 'depr' metrics are used in the sample entry.

4.1.4 Decoding operation

The Decoder-Power Reduction ratio are percentages. `dec_op_reduc_ratio_from_max` value can be directly exploited by the client.

The client needs to substract 32768 to the `shift_dec_op_reduc_ratio_from_prev` value to get a signed percentage `dec_op_reduc_ratio_from_prev` which can be exploited.

4.2 Display-Power Reduction metric

4.2.1 Definition

The Display-Power Reduction metric is defined in the CD of ISO/IEC 23001-11 - Energy-Efficient Media Consumption (Green Metadata) [2]. It provides frame statistics and quality indicators for the media track that the metadata track refers to by means of 'cdsc' reference.

4.2.2 Metric name

The Display-Power Reduction sample shall be provided under the 'dipr' metric name.

4.2.3 Sample storage format

Display-Power Reduction sample format is given in 2.6.

`max_intensity` shall be stored as unsigned 8-bit integer value into the x_value field.

`psnr` shall be stored as unsigned 8-bit integer value into the y_value field.

num_entries is set to the number of couples of values which are judged necessary to get a good precision of the metric.

4.2.4 Decoding operation

The max_intensity is directly given by the `x_value`. The corresponding PSNR value (in dB) is given by the `y_value`.

5 References

[1] w14129 – MPEG Systems Technologies – Part 10 : Carriage of Timed Metadata Metrics of Media in the ISO Base Media File Format

[2] w14131 – MPEG Systems Technologies – Part 11 : Energy-Efficient Media Consumption (Green Metadata)