

MPEG-7 for Video Quality Description and Summarisation

Peter Schallauer, Hermann Fürntratt, Werner Bailer

(JOANNEUM RESEARCH, Graz , Austria
{firstname.lastname}@joanneum.at)

Abstract: Manual quality control of audiovisual content in the different steps of the media production, delivery and archiving process causes significant costs. Semi-automatic quality control requires automatisisation of quality analysis, quality metadata interoperability and efficient visualisation tools. In this paper we propose the use of MPEG-7 for standard compliant description of media quality metadata and a quality summary visualisation tool which facilitates efficient exploration of visually impaired content by the user.

Keywords: MPEG-7, Quality, Descriptor, Description Scheme, Multimedia

Category: H.5.1, H.3.1, H.5.2

1 Introduction

Quality control of audiovisual content is important in several steps of the media production, delivery and archiving process. Broadcasters are checking audio and video quality within the ingest process, after editing, after encoding and before play-out for terrestrial, satellite and cable broadcast or for delivery to internet and video-on-demand services. Archives are checking for content integrity at archive ingest and delivery. Content providers are checking post production content for correct encoding and conformance to the required quality and format standard. Quality metadata interoperability is a prerequisite for integrating these tasks in the overall process.

2 Video Quality Description

There exist different tasks in the media production process dealing with quality related metadata. In order to facilitate interoperability and exchange of defect and quality descriptions between these tasks, a standardised way of description must be used. The description must be able to represent all the results obtained by automatic quality analysis tools as well as additional annotation made by operators. It must both support gaining a quick overview of the overall quality, type and severity of the defects present in the material, as well as describing the detailed measures returned by the tools when applicable.

MPEG-7 [MPEG-7 01] is a standard for the description of multimedia content, including structuring the content as well as describing a number of low-, mid- and high-level features for each of the segments in the structure. The defect and quality description is based on the MPEG-7 Detailed Audiovisual Profile (DAVP) [Bailer 06]. The original version of the standard provides very simple means for describing a quality rating and listing defects present in a segment, but without the capability to specify more in depth information. An amendment to the MPEG-7 audio part [MPEG-7/4 04] defines a more detailed description of audio signal quality, allowing

describing a set of measures per segment as well as a list of error events with different temporal scope and further properties.

Based on the existing work in the audio part, we have defined a similar description framework for the visual domain with even more capabilities for describing details of defects. A list of defects and quality measures can be described for each segment: quality measure descriptors contain the statistics for a segment, while defect descriptors describe an occurrence of a defect in more detail.

There is a generic visual descriptor for defects which specifies general properties and references the defect in a comprehensive impairment classification scheme (based on the BRAVA broadcast archive programme impairments dictionary¹). This is the minimum description of a defect, specifying the type of defect and the segment of its occurrence. In addition, specific descriptors for a number of defects and quality measures have been defined², which allow to describe their respective properties.

3 Visualisation of Defect and Quality Analysis Results

The visualisation of defect and quality analysis results must support the user in quickly getting an overview of the condition of the material. For that purpose, we have implemented the defect and quality summary viewer shown in Figure 1.

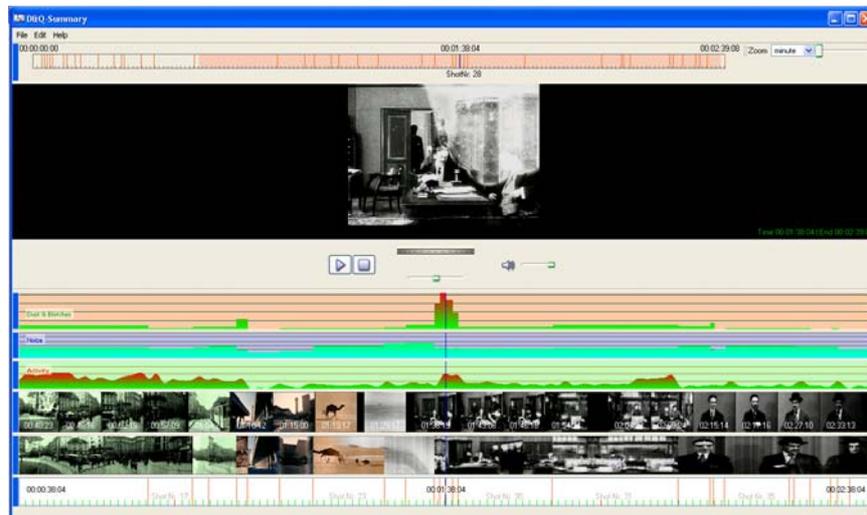


Figure 1: The quality summary viewer.

The tool supports the user in efficiently navigating the content by providing a timeline representation of a number of views. All views are synchronised with the video player. The temporal resolution can be changed so that the user can freely change the level of detail shown. The timeline views show the shot structure of the material, selected representative key frames, stripe images created from the central columns of

¹ http://brava.ina.fr/brava_public_impairments_list.en.html

² The extension schema can be downloaded from <http://mpeg7.joanneum.at>

the images in the sequence and a number of graphs visualising defects and quality measures. In the screenshot one of the graphs shows the visual activity, which is not a quality measure, but a helpful indicator in the context of restoration. High visual activity indicates either large scale defects (e.g. blotches) or a high amount of motion, which often complicates the restoration process. The other graphs show the shot-wise dust level as the median fraction of the image area covered by dust and grain noise as the image to grain noise ratio.

The temporally condensed overview allows the user to quickly grasp the frequency and strengths of the impairments in the material. From the statistical measures for the individual defects, especially dust and noise level, the needed restoration steps and tools can be planned. Together with the severity of the defects and the user's knowledge about the capabilities of the restoration tools in use the required manual effort and the restoration costs can be estimated. For those defects which are described as defect events, such as big distortions or missing frames, the user can estimate the restoration effort directly from the number of events. Defect event information can also be used for direct examination and restoration of these time intervals in the movie, without having to view the rest of the material.

Acknowledgements

The authors would like to thank Werner Haas, Georg Thallinger, Hannes Fassold, Harald Stiegler as well as several other colleagues at JOANNEUM RESEARCH, who contributed valuable input to the work. This work has been funded partially under the 6th Framework Programme of the European Union within the IST project "PrestoSpace" (IST FP6-507336, <http://www.prestospace.org>).

References

- [Bailer 06] Bailer, W., Schallauer, P.: "The Detailed Audiovisual Profile: Enabling Interoperability between MPEG-7 Based Systems," *Proc. of 12th International Multi-Media Modeling Conference*, Beijing, CN, Jan. 2006.
- [MPEG-7/4 04] Information Technology – Multimedia Content Description Interface, Part 4: Audio, ISO/IEC 15938-4:2002/Amd 1:2004.
- [MPEG-7 01] Information Technology – Multimedia Content Description Interface, ISO/IEC 15938, 2001.
- [Schallauer 07] Schallauer, P., Bailer, W., Mörzinger, R., Fürntratt, H., Thallinger, G.: "Automatic Quality Analysis for Film and Video Restoration", *Proc. of IEEE International Conference on Image Processing*, San Antonio, TX, USA, Sept. 2007, to appear.