MATLAB TOOL FOR NO REFERENCE VIDEO QUALITY EVALUATION

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Abstract: This paper deals with methods for video quality evaluation without reference. We describe the basics of quality assessment in spatial domain, as well as the bitstream oriented approach. The main focus of this paper is design of a Matlab tool for easy video quality evaluation using several spatial domain oriented metrics.

Keywords: video quality, GBIM, no-reference, NR, H.264

1 INTRODUCTION

Video quality has become one of the important topics recently. Testing of new-designed video codecs, optimal settings for digital video broadcasting or just autofocus systems in our cameras are all fields where picture quality evaluation gets into the game. In this field, we have more possibilities, how to perform this quality measurement. If we are strictly talking about objective quality metrics (based on computation, not on real observers), we can see three different approaches. If original picture (or video sequence) is available, we talk about full-reference quality metrics. If just some reduced information about the original sequence is present, the term reduced-reference metric is being used. And at last if we do not have any information about the tested video, no-reference approaches are being used. A lot of no-reference (NR) metrics have been developed, this paper briefly describes some of these principles and the main focus is the design of Matlab tool for easy evaluation of video quality [3].

2 USED METRICS

In our Matlab tool, which will be described later, we use two different metrics. The first one is called Generalized Block-Edge Impairment Metric (GBIM) [1]. As we can see from its name, this metric tries to compute distortion caused by blocking artifacts, which is typical for MPEG-2 coded videos because of typical block structure. The metric's algorithm estimates the final quality score by finding differences at the boundaries of adjacent blocks. Another metric we use is metric by Pina Marziliano for perceived blur. This algorithm is slightly more complicated and can be found in [2]. Both of these metrics work in spatial domain, which means that the decoded picture is necessary. Metrics were designed for still pictures but when used on every frame of video sequence, they can also be used for our purpose.

3 NO REFERENCE VIDEO QUALITY TOOL

For the purpose of our work, a Matlab tool called *No Reference Video Quality Tool* (NR VQT) was developed. This tool has to perform following tasks:

1. Choosing video file;
2. Getting information about the file (used codec, resolution, number of frames);
3. Reading video data;
4. Computation of chosen quality metric;
5. Displaying of results.

Most of these tasks are executed in the Matlab environment but for some of them an external application is used. For video decoding and also for getting information about the chosen file we use the *ffmpeg* package[1]. This may look as a complication but as testing showed, we achieved that our tool is system independent (in a way of used codecs). Also time needed for reading video file decreased because *ffmpeg's* output is .yuv file which we can be read very easily into Matlab environment. The snapshot of the NR VQT can be seen in Fig. 1. The environment of the tool is divided in three logical sections. The user can choose number of frames he wants the metric to run on. As can be

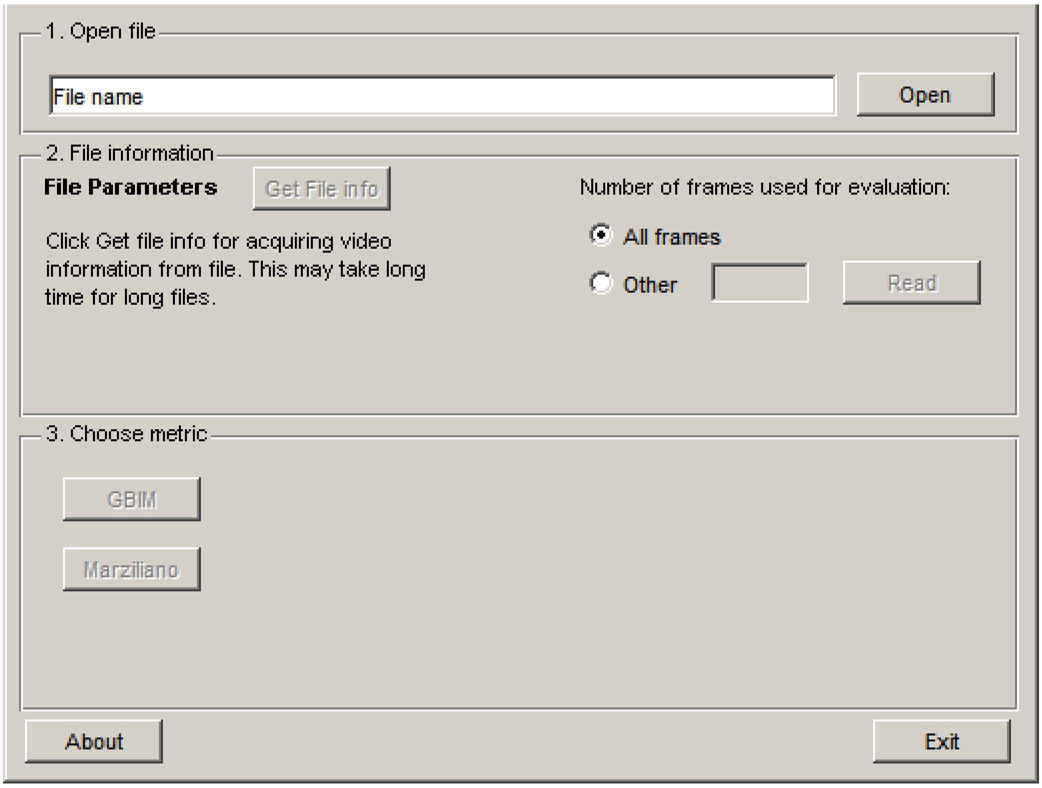

Figure 1: Environment of No Reference Video Quality Tool.

seen, after initialization of the tool, some of the control buttons are inactive. This works as a simple user error protection, because it leads the user to perform the tasks in logical order. After clicking on the superior button and if its task was performed successfully, next button becomes active. After choosing the desired metric, the evaluation is started. The user is informed about this process by a progress bar. After the computation has finished, results are displayed, as shown in Fig. 2. At this time, we compute the *Overall score* using Minkowski summation. In the next step of our work, we will implement also other temporal pooling methods and a comparison of these is expected. In our tool, we also put emphasis on optimization of the run of the application. We try to avoid loops where not necessary, the use of *ffmpeg* also decreases computation time.

[1] www.ffmpeg.org

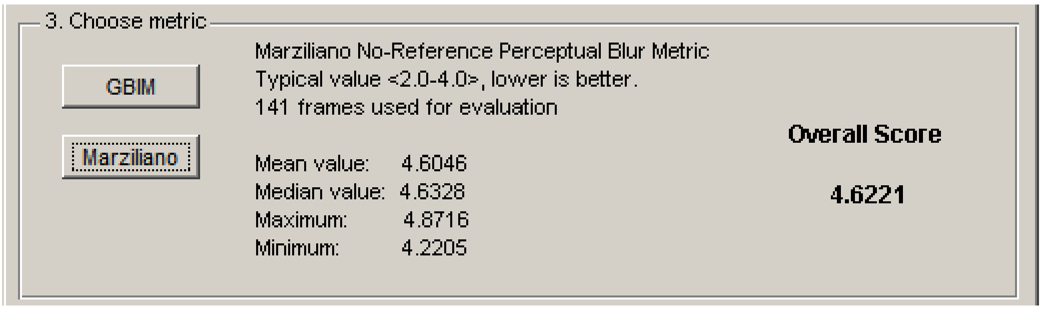

Figure 2: Displaying results.

4 FUTURE DEVELOPMENT

In the next step of our work, we would like to implement a bitstream-oriented metric. At this time, experiments with H.264 codec are conducted. We need to extract transform coefficients from the bitstream, which will be then used for evaluation. To do so, we use a Modified JM H.264/AVC Codec[2], which allows us during decoding to create a xml file with desired transform coefficients. The scheme of the whole task from choosing file to computing quality metric is shown in Fig. 3. Next expansion of the tool also involves use of other temporal pooling methods, which can have significant impact on the final results.

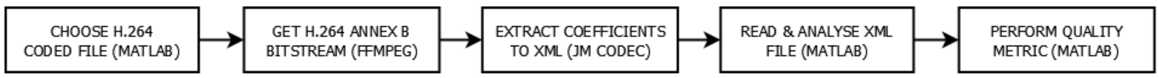

Figure 3: Scheme for quality evaluation based on H.264 bitstream.

5 CONCLUSION

In this paper we showed how video quality evaluation can be performed. A Matlab based tool for no reference measurements was developed. Also future work on the project was discussed. Except above mentioned, a series of objective video quality tests with our tool will be conducted and the results will be compared with subjective tests.

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[2] http://vqegstl.ugent.be/?q=node/14