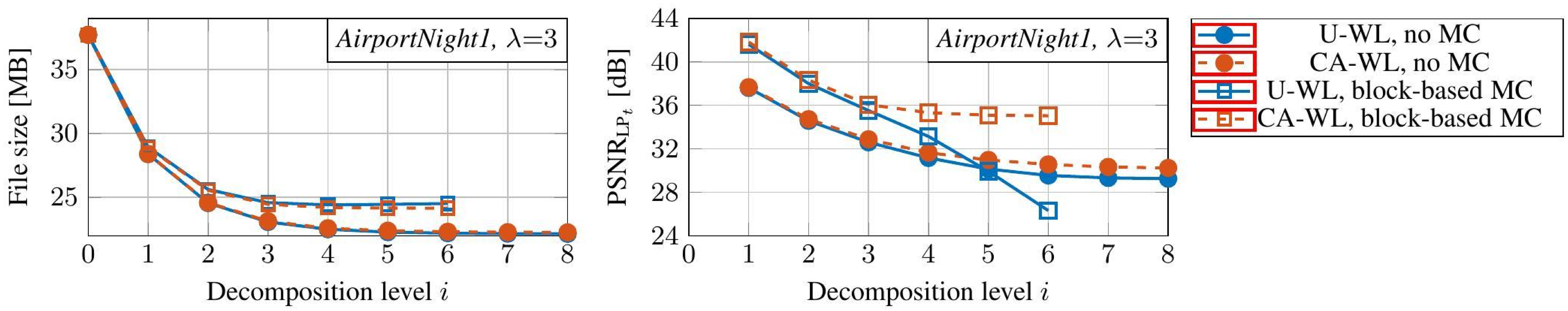

Fig. 3: Absolute rate and $\mathrm{PSNR}_{\mathrm{LP}_t}$ results from the *AirportNight1* sequence with and without MC, using λ=3. The results are displayed over all reached decomposition levels i. The proposed method is characterized by the dashed lines.

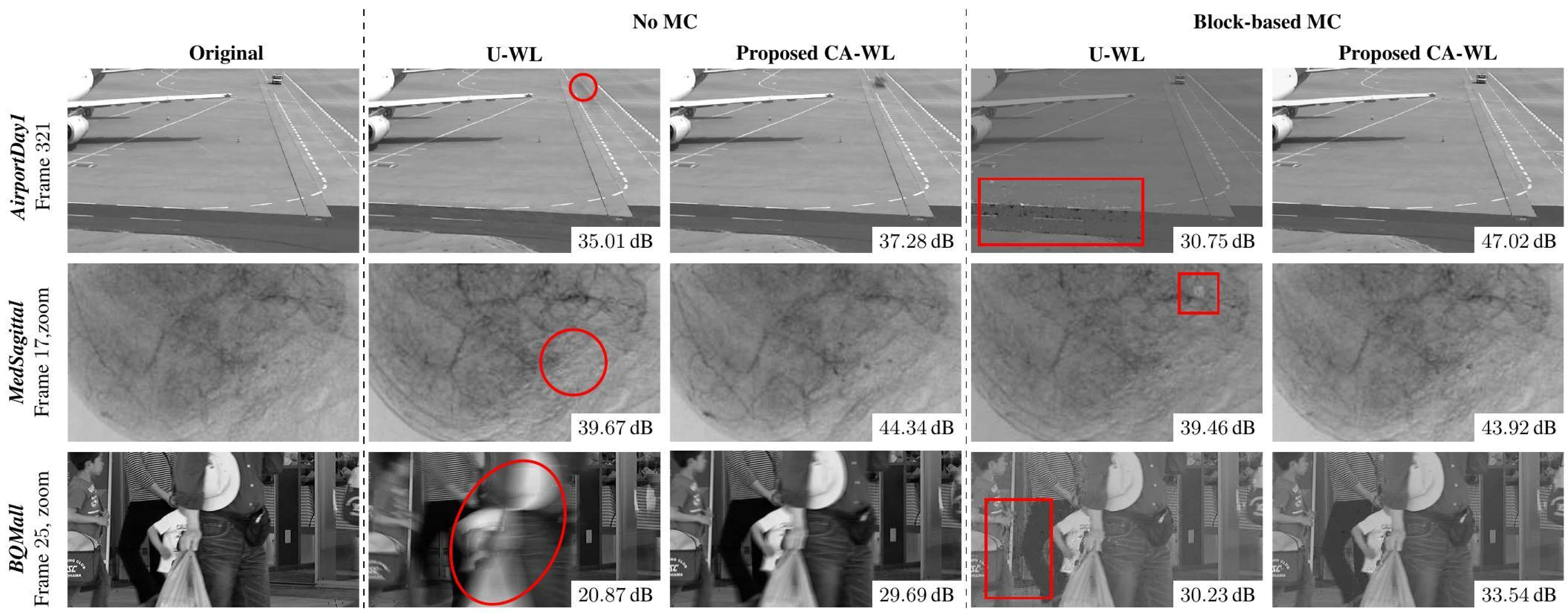

Fig. 4: Comparison of the visual quality of one frame from each test data set compared to the corresponding LP frames of a U-WL and our CA-WL with and without block-based MC, for $\lambda = 3$. The rectangles depict blocking artifacts, the circles indicate missing objects, and the ellipses show blurring artifacts.

to 1.06% in total average, while the visual quality is increased by $10.28\,\mathrm{dB}$, as the right column of Table 2 shows.

To demonstrate the performance of our proposed CA-WL in more detail, Fig. 3 presents the absolute rate and $\mathrm{PSNR}_{\mathrm{LP}_t}$ results from the *AirportNight1* sequence with and without MC, using λ=3. As the left plot offers, the entire file size for incorporating MC is always higher than omitting MC. However, the visual quality is significantly higher by including MC, which is very important for many professional applications. But for higher decomposition levels i, the error propagation due to imperfect MC is increasing. The right plot shows the strong decreasing $\mathrm{PSNR}_{\mathrm{LP}_t}$ results, which can be prevented by our proposed CA-WL. Simultaneously, the overall file size can be decreased, as the left plot of Fig. 3 shows.

In Fig. 4, some visual results for each data set are presented. From left to right, the reference frame and the corresponding LP frames from the U-WL and the proposed CA-WL are shown for a value of λ=3, without MC and with block-based MC, respectively. Disturbing artifacts and loss of content, resulting from the U-WL, are highlighted in every frame. The rectangles depict blocking artifacts, the circles indicate locations of objects, which are canceled out completely, and the ellipses show blurring artifacts. As the right column shows, the CA-WL is capable to compensate this lack of data fidelity efficiently and gives a reliable impression of the actual content of the sequence. This is also proven by the PSNR values given at the bottom right corner of each frame.

5. CONCLUSION

Scalable lossless video coding and a high visual quality of the corresponding BL is very important for many professional applications. Wavelet-based video coding provides full scalability without additional overhead. The temporal resolution can be controlled by the recursive application of the WT in temporal direction to the LP subband of the previous stage. This leads to lower bit rates, but if the content of the underlying video sequence comprises strong motion, the visual quality of the BL is degraded significantly. We proposed a method which locally adapts the temporal scaling by evaluating a Lagrangian cost functional in every transformation step and prevents further decomposition, if the costs of the current level are higher than the costs of the previous level. This way, we can increase the visual quality of the BL by $10.28\,\mathrm{dB}$ compared to the U-WL with block-based MC, while the required rate is reduced by 1.06% at the same time. Further work aims at the development of an algorithm to determine the optimum value of λ in a rate-distortion sense, based on the characteristics of the underlying sequence.

6. ACKNOWLEDGMENT

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