Multiple Description Coding for 3D Video

Hezerul Abdul Karim

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University of Surrey

Centre for Communication and Systems Research
Faculty of Engineering and Physical Sciences
University of Surrey
Guildford, Surrey GU2 7XH, UK

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Abstract

In the near future, 3D video is likely to be used to enhance video applications, as it offers a greater sense of immersion. When 3D video is compressed and transmitted over error prone channels, the associated packet loss leads to poor visual quality. Hence, error resilience techniques for 3D video are needed. This thesis aims to improve the error robustness of the compressed 3D video in error prone transmission scenarios.

Firstly, this thesis describes how 3D video can be represented using 2D video information, and depth information. This format can be compressed using tools available in some video coding standards, including Multiple Auxiliary Component (MAC) tool in MPEG-4 version 2, and the use of reduced resolution coding for depth compression. It is observed that the reduced resolution depth compression provides improved 2D video performance. However, the quality of the depth information is limited at high bit rates due to the distortion introduced by down-sampling and up-sampling (DSUS).

Secondly, Multiple Description Coding (MDC), based on even and odd frames is proposed for error resilient 3D video. Improvements are made to the original scheme by adding a controllable amount of side information to improve frame interpolation at the decoder and compression efficiency. The side information is also sent according to the video sequence motion for further improvement. The performances of the proposed MDC algorithms are found to be better than single description coding (SDC) and the original scheme at high error rates with reduced error free coding efficiency.

Finally, the combination of Scalable Video Coding (SVC) and MDC (scalable MDC) for 3D video is investigated for error robustness and scalability. A scalable MDC scheme based on even and odd frames is proposed for H.264 based SVC. Reduced resolution depth compression is then applied to improve the performance. The proposed algorithms provide better 3D video performance than the original SVC in error prone environments and for low bit-rate video.

Key words: stereoscopic 3D video coding, 2D and depth, error resilience, multiple description video coding, scalable multiple description video coding.

Email: H.Karim@surrey.ac.uk

WWW: http://www.surrey.ac.uk/