

Video Coding for Machines – A review

- 時間：2022年11月14日(一) 13:20~14:10
- 地點：國立陽明交通大學 工程三館345室

Abstract – Video coding is one of the crucial communication technologies, as video transmission is the dominant traffic component in the world communications network. Video accounts for over 80% of the global IP traffic. Therefore, huge efforts were done towards increasing coding performance in the sense of the relation between the bitrate and the decoded video quality perceived by humans. These efforts resulted in the development of such successful video compression technologies like AVC, HEVC, AV1, EVC, and VVC. However, in the last years, we observe rapid growth of machine vision applications. The proliferation of Internet of Things, autonomous vehicles, increasing employment of sensors, and the evolution of machine learning methods are only some of the factors that stimulate a rash increase of amount of video data shared between computers, often even without direct human consumption of video. The new paradigm of video coding for machines triggers remarkable research interests, although the proposed approaches are quite diverse.

In response to the needs for technology appropriate for such applications, the ISO MPEG expert groups have already launched activities towards development of the relevant compression technology and the corresponding standard tentatively called Video Coding for Machines (VCM). The work was divided into two tracks: Track 1 is focused on compression of features with no need to decode an image or video, whereas Track 2 assumes that an image or video is reconstructed in a decoder and the machine vision tasks are executed on a decoded image or video. In October 2022, the responses to Call for Evidence for Track 1 and Call for Proposals for Track 2 were reviewed.

The lecture provides an overview of the technologies proposed in the abovementioned responses as well as those proposed in the journal and conference papers.

講師簡介

MAREK DOMAŃSKI received M.Sc., Ph.D. and Habilitation degrees from Poznań University of Technology, Poland in 1978, 1983 and 1990, respectively. Since 1993, he is a professor at Poznań Univ. of Technology, where he is the director of Institute of Multimedia Telecommunications. He coauthored one of the very first AVC decoders for tv set-top boxes (2004) as well as highly ranked technology proposals to MPEG for scalable video compression (2004), 3D video coding (2011), and immersive video coding (2019). He authored 3 books and over 300 papers in journals and conference proceedings. 16 patents granted by European Patent Office and United States Patent and Trademark Office with him as a co-inventor.



He is active in international standardization expert group MPEG, currently by MPEG-I (MPEG Immersive). He serves as a co-editor for MPEG Test Model for Immersive Video. He promoted (directed) 23 candidates to Doctor degree. The contributions were mostly on image, video and audio compression, virtual navigation, free-viewpoint television, image processing, multimedia systems, 3D video and color image technology, digital filters and multidimensional signal processing. He was leading many research projects funded by Polish institutions (science foundations and agencies), EU and NATO, as well as industry and industrial institutes from Poland, China, Japan, Rep. of Korea, Germany, USA etc. He is He was General Chairman/Co-Chairman and host of several international conferences: Picture Coding Symposium, PCS 2012; IEEE Int. Conf. Advanced & Signal based Surveillance, AVSS 2013, European Signal Processing Conference, EUSIPCO 2007; 73rd and 112nd Meetings of MPEG; Int. Workshop on Signals, Systems and Image Processing, IWSSIP 1997 and 2004; Int. Conf. Signals and Electronic Systems, ICSES 2004 and others. He served as a member of various steering, program and editorial committees of international journals and international conferences.

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Advanced Adaptive Arithmetic Coding in Video Compression

- 時間：2022年11月14日(一) 14:30~15:20
- 地點：國立陽明交通大學 工程三館345室

Abstract:

Entropy data compression is an important component of efficient video coding techniques. Its use in a video encoder contributes to a significant improvement in compression efficiency, reducing the size of the encoded data stream even multiple times. For this reason, entropy compression methods are an interesting subject of scientific research.

The Context-based Adaptive Binary Arithmetic Coding (CABAC) technique, developed after the year 2000, proved to be a milestone in the worldwide development of these methods. This technique is a very advanced implementation of the arithmetic coding, and was designed to compress efficiently data in hybrid video encoders. In this context, the CABAC technique is ranked among the most efficient entropy coding solutions, which results in its practical application in new-generation video compression techniques: MPEG-4 AVC/H.264, MPEG-H HEVC/H.265 and MPEG-I VVC/H.266. It is also the starting point for the most advanced scientific research conducted in the world in the field of entropy compression of data.

The aim of the talk is to present the key mechanisms of the CABAC technique. The intention is also to indicate possible ways of improving the CABAC and to present the impact of the application of new solutions on the efficiency of data compression. The talk will also discuss the aspect of complexity of the software of contemporary entropy compression methods.

講師簡介

DAMIAN KARWOWSKI received his M.Sc. and Ph.D. degrees from Poznan University of Technology in 2003 and 2008, respectively. Currently he is an assistant professor at Poznan University of Technology, a member of the Faculty of Computing and Telecommunications. He is an author and co-author of over 50 papers on digital video compression in both national and international conferences and journals. He has been taking part in many industry-oriented projects that encompasses video and audio compression. He was Technical Program Chair of International Workshop on Signals, Systems and Image Processing, IWSSIP 2017, Technical Program Chair of Picture Coding Symposium, PCS 2012, and member of the organizing committee of International Workshop on Signals, Systems and Image Processing, IWSSIP 2004, International Conference on Signals and Electronic Systems, ICSES 2004, 73rd Meeting of MPEG and European Signal Processing Conference, EUSIPCO 2007. His professional interests are centred on image, video and audio compression algorithms, and realization of video and audio codecs on PC and DSP platforms.



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