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Satellite Data Compression, Communications, and Archiving III

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Editors

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Contents

vii	Conference Committee
ix	Introduction

DATA COMPRESSION I

6683 02	Prediction of wavelet transform coefficients using neural networks applied to lossless compression of multispectral images [6683-01] D. G. Acevedo, A. M. C. Ruedin, L. M. Seijas, Univ. de Buenos Aires (Argentina)
6683 03	Modifying file syntax for interactive decoding the recommendation (CCSDS-122-B-1) [6683-02] F. García-Vílchez, F. Aulí-Llinàs, J. Serra-Sagristà, Univ. Autònoma de Barcelona (Spain)
6683 04	Current status of satellite data compression in Canadian Space Agency (Invited Paper) [6683-03] S.-E. Qian, A. Hollinger, Canadian Space Agency (Canada)
6683 05	CNES studies of on-board compression for multispectral and hyperspectral images (Invited Paper) [6683-04] C. Thiebaut, E. Christophe, CNES (France); D. Lebedeff, Thales Alenia Space (France); C. Latry, CNES (France)

DATA COMPRESSION II

6683 06	Lossless data compression studies for the geostationary imaging Fourier transform spectrometer (GIFTS) with the bias-adjusted reordering preprocessing [6683-05] B. Huang, S.-C. Wei, A. H.-L. Huang, M. Smuga-Otto, R. Knuteson, H. E. Revercomb, W. L. Smith, Sr., Univ. of Wisconsin, Madison (USA)
6683 07	A new lossless compression algorithm for satellite earth science multi-spectral imagers [6683-06] I. Gladkova, S. Gottipati, M. Grossberg, CCNY, NOAA/CREST (USA)
6683 08	Overview of radar data compression [6683-07] V. Lakshmanan, Univ. of Oklahoma (USA) and National Severe Storms Lab. (USA)
6683 09	Use of independent component analysis for lossless compression of ultraspectral sounder data [6683-08] S.-C. Wei, Tamkang Univ. (Taiwan); B. Huang, Univ. of Wisconsin, Madison (USA)

COMMUNICATIONS ENGINEERING

- 6683 0A **GEONETCast Americas: vision and plans** [6683-09]
R. A. Fulton, H. M. Wood, L. V. Moodie, P. Seymour, National Oceanic and Atmospheric Administration (USA)
- 6683 0B **Controlling satellite communication system unwanted emissions in congested RF spectrum** [6683-10]
D. Olsen, The Aerospace Corp. (USA); R. Heymann, NOAA-NESDIS (USA)
- 6683 0D **Theoretical study of use of optical orthogonal codes for compressed video transmission in optical code division multiple access (OCDMA) system** [6683-13]
S. Ghosh, B. N. Chatterji, B.P. Poddar Institute of Management and Technology (India)

DATA COMPRESSION III

- 6683 0E **Lossless compression of the geostationary imaging Fourier transform spectrometer (GIFS) data via predictive partitioned vector quantization** [6683-14]
B. Huang, S.-C. Wei, A. H.-L. Huang, M. Smuga-Otto, R. Knuteson, H. E. Revercomb, W. L. Smith, Sr., Univ. of Wisconsin, Madison (USA)
- 6683 0F **A comparative study of lossless compression algorithms on MODIS data** [6683-15]
S. Gottipati, J. Goddard, M. Grossberg, I. Gladkova, CCNY, NOAA/CREST (USA)
- 6683 0G **Ultraspectral sounder data compression using the Tunstall coding** [6683-16]
S.-C. Wei, Tamkang Univ. (Taiwan); B. Huang, L. Gu, Univ. of Wisconsin, Madison (USA)
- 6683 0H **Fast minimum-redundancy prefix coding for real-time space data compression** [6683-17]
B. Huang, Univ. of Wisconsin, Madison (USA)

REMOTE SENSING DATA ARCHIVING, MANAGEMENT, AND DISTRIBUTION

- 6683 0I **Operational environmental satellite archives in the 21st century (Invited Paper)** [6683-18]
B. R. Barkstrom, J. J. Bates, J. Privette, National Climatic Data Ctr. (USA); R. Vizbulis, NOAA Satellite Operations Facility (USA)

DATA COMPRESSION IV

- 6683 0K **A novel framework of FGS video coding based on EBCOT** [6683-21]
J. Zhang, X. Gao, Xidian Univ. (China)
- 6683 0L **The impact of striping artifacts on compression** [6683-22]
M. Grossberg, S. Gottipati, I. Gladkova, CCNY, NOAA/CREST (USA)
- 6683 0M **The compression algorithm of target image based on ROI** [6683-24]
L. Gu, S. Guo, Jilin Univ. (China); W. Jing, C. Zhai, Changchun Univ. of Science and Technology (China); X. Lu, Jilin Univ. (China)

- 6683 ON **Fast inter-frames pattern chosen algorithm based on H.264** [6683-20]
Q. Lin, G. Feng, HuaQiao Univ. (China)
- 6683 OO **A fast pattern chosen algorithm for intra-frames prediction** [6683-23]
Q. Lin, G. Feng, HuaQiao Univ. (China)

Author Index

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Remote Sensing Data Archiving, Management, and Distribution II

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Valliappa Lakshmanan, University of Oklahoma (USA) and National
Severe Storms Laboratory (USA)

Data Compression IV

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Valliappa Lakshmanan, University of Oklahoma (USA) and National
Severe Storms Laboratory (USA)

Concluding Panel Discussion on Data Compression

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Introduction

The papers in this volume are the manuscripts behind presentations made at the SPIE's annual meeting, SPIE Optics + Photonics 2007, held 26–30 August 2007 in San Diego, California, USA. These papers and their presentations constitute SPIE Conference 6683 on Satellite Data Compression, Communications, and Archiving III, held on the last two days of the symposium, 29–30 August 2007. The conference brought together researchers, engineers, and administrators involved in observation and analysis of the Earth from satellites. Participants included members of the civilian Earth and space community from around the globe. Presentations and papers were submitted from participants from Argentina, Canada, China, France, India, Spain, Taiwan, and United States of America.

This was the third year of this conference. The three components of the conference were all connected: compression, satellite communications engineering and distribution, and issues such as archiving and data management. A central theme across all these components was the problem of data handling of large data rates generated from the atmospheric sensors located on-board satellites necessary to monitor the Earth and its environment. As a result of the tremendous advancements in the quality and resolution quantity in each of these sensors, the rate of data they produce has increased dramatically. Further, satellites platforms host a number of these advanced sensors which must share a limited down-link bandwidth. For instance data rates for an increment can sometimes exceed 60Mbps.

One essential tool to manage data volume, which must share the limited radio frequency bandwidth as it is transmitted from the satellite, is data compression. Data compression also has an important role in distribution and in archiving. Because the requirements on the data end use vary, and characteristics of the data vary, a wide range of different data compression schemes must be considered. For instance lossless, near-lossless and lossy schemes are being considered where appropriate for use within the system. For some applications, such as transmission over a noisy channel, error correction is essential, for other applications the algorithms throughput or compression rate are more important. This has driven an effort to evaluate and develop open algorithms and implementations that can be shared globally. We have also seen Shannon's information theory used to create benchmarks to evaluate the algorithms against optimal performance in a principled way.

A lesson that can be drawn from the diverse presentations at this conference is that the heterogeneous nature of satellite sensor data characteristics (statistics) and the variety of end uses (requirements) has led to the realization that available generic compression algorithms are insufficient. Generic transforms such as wavelets may work well on some types of data (such as visible images) or

in some modes (such as lossy). The methods however, often break down when applied to data they were not designed to handle such as hyper and ultra-spectral data, or modes they were not optimized for such as lossless mode. By collecting the wide range of novel and creative approaches to satellite data compression, this volume and the associated conference, is aimed at advocating a broad and global dialog that allows us to find or develop the best tools for this new challenge.

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