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FRUCT Conference 2010

Skt. Petersborg

Trends in Video Coding and Processing

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DTU Fotonik
 Department of Photonics Engineering

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Vision and mission of DTU Fotonik at the Technical University of Denmark

- To be an education and research center of world-class excellence within the fields of telecommunications and optical technologies
- DTU Fotonik emphasizes
 - Leading edge research
 - Education of highly skilled B.Sc., M.Sc. and Ph.D. candidates, international programmes for M.Sc. and Ph.D.
 - Top-level education within telecommunication and optics
 - Efficient and mutually binding collaboration with industry
 - Innovative activities that can create further industrial development in our field




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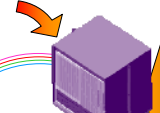
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DTU Fotonik – DTU's Center for Telecommunication


Components

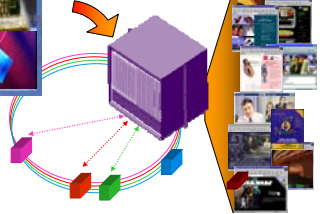


Systems and networks



Services and Net economy





- 200+ staff incl. 60+ PhD students
- 70 M.Sc. thesis projects in 2008


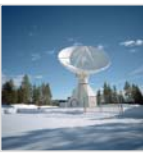

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Coding & Visual Communication Technology

The purpose of the research is to create new and optimize existing coding methods for effective communication systems.

- Image coding
- Video coding – distributed video coding
- Visual communication technology
- 3D-TV and flat panel displays
- Algebraic and convolutional coding and concatenated coding systems
- Decoding algorithms – iterative
- Applications in radio, space, satellite, and optical communication

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Vision: Real-time global free-view 3D TV



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Project Activities at Coding, DTU Fotonik



- Image and video coding for space application, ASIM (ESA Phase C/D)
- Processing H.264 **AVC** coded video for LED/LCD displays
- 3D and multi-view TV, **MVC**
- Distributed video coding, **DVC**, and scalable video coding, **SVC**
- IP-based video coding and applications for communication networks
- Receiver design – optical and wireless
- ESA, Telemetry Channel Decoding System
- High speed decoding of high-rate product codes, eg. for optical communication, 100Gbit/s FEC

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Optimal processing for flat panel displays



Optimal video decoding (MPEG) and processing.

- Optimal decoding for flat-panel displays, back-light dimming and conversion to HDTV.
- Processing H.264 **AVC** for Local dimming of LED-LCD backlight displays
- Industry: Bang&Olufsen



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LCD/LED Local Backlight Dimming



- LED for backlight
 - Wide color gamut
 - Fast
 - Durable and Resistant
 - Flexibility
- Local dimming
 - Backlight intensity changing in time and space
 - Improved contrast
 - **Reduced power consumption**
 - **EU regulations**

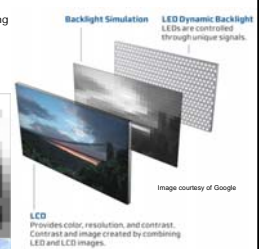


Image courtesy of Google

A Multi-View Image and Video Coding Scheme (MVC)
based on View Warping and 3D-DCT

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Depth Information

Texture data Depth map

Texture and depth available for each view.

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3D Warping

View 0
+

Depth 4

Warped view

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Multi-View Image Encoder Scheme

3D warping

stacking

Pre-processing

Transformation & Quantization

Entropy coding

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Pre-processing

hole-filling

Viewing camera

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Transformation & Quantization

- 8x8x8 3D-DCT
 - X dimension
 - Y dimension
 - View dimension
- JPEG-like 3D quantization matrix

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Occlusion Regions handling

occlusion warping

4 5 6 7

4 5 10%

0 1 2 3

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Experimental Results / 1

PSNR vs bpp "breakdancers"

PSNR (dB)

39 38 37 36 35 34 33 32 31

0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04

—●— H.264 MVC

—■— Proposed

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