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PROBLEM
PROBLEM

Image Coding Evolution

GPU

Computational complexity

JPEG2000

+ Enhanced compression
+ Region-of-interest coding
+ Interactive transmission
+ Progressive lossy-to-lossless
+ Error resilience

1990

Now

Image data
JPEG2000 Coding Pipeline

PROBLEM

80% Computational time
SOLUTION
SOLUTION

The Proposal

JPEG2000

Arithmetic coder
↓
bitstream

BPC-PaCo
(BPC with Parallel Coefficient processing)

N Stripes

N Arithmetic coders
↓
bitstream
New mechanisms

- Stripes subdivision
- Parallel scanning order
- Static probability model
- Adapted context formation
- Fixed-length arithmetic coding
- Cooperative bitstream generation
RESULTS
RESULTS

Coding performance

![Graph showing PSNR difference (in dB) vs. bitrate (in bps) for JPEG2000 and BPC-PaCo with a -2% decrease highlighted.](image)
RESULTS

Computational performance

- **Encoder**
  - CPU: 8x Intel Xeon E5-4620 (64 HW threads)
  - 5 satellite images
    - 10240 x 10240
    - 8 bit grey scale

- **Decoder**
  - GPU: GTX TITAN X

**Graph**

- **Kakadu**
  - x25

- **GPU JPEG2K**
  - x95

- **BPC-PaCo**
CONCLUSIONS
CONCLUSIONS

JPEG2000 \uparrow\uparrow\uparrow \text{complexity}

BPC-PaCo \uparrow\uparrow\uparrow \text{parallelism}

\downarrow 2\% \text{coding performance}

\uparrow\uparrow\uparrow x25 \text{SpeedUp}
**Publications**

**Strategies of SIMD computing for image coding in GPU**
IEEE International Conference on High Performance Computing (HiPC)  
2016

**Bitplane Image Coding With Parallel Coefficient Processing**
IEEE Transactions on Image Processing  
2016

**Strategy of microscopic parallelism for bitplane image coding**
IEEE Data Compression Conference (DCC)  
2015

**Implementation of the DWT in a GPU through a Register-based Strategy**
IEEE Transactions on Parallel & Distributed Systems  
2014

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**About us**

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