Low-Latency Lossless Video Compression Methods for Multi-camera Systems
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Introduction

Multi-camera System
- 3D vision
- Depth calculation
- Image mosaicing for higher overall resolution
- 360° omnidirectional video
- View interpolation

Problems
- High bandwidth requirement
- High storage
- Challenge
- Real-time

Lossless compression algorithms
- Reducing bandwidth usage
- Preserving image detail
- In hardware
  - Real-time compression
  - Low latency
  - No frame buffers
- Spatial prediction algorithm

Context-based, adaptive lossless image coding
- CALIC
- P = Gradient-adjusted prediction

Improvements

Find optimal probability density function
- Gaussian, Laplace
- Transmit only parameters
- Average, standard deviation, ...
- Quick calculation
- Possible use of previous frame or line

Sacrifice of perfect Huffman table

Blue line is real one, perfect Huffman coding, red one is Gaussian, yellow one is Laplace

overflow---The bright or dark part of image

Raw Bayer image

Noise estimation

Noise
- Improve compression by reducing needed bits
- adding the noise from 1bit to 8bits

The top one is adding one bit noise, and the second one is adding two bits noise... The bottom one is adding 8 bits.

8 x 5 MP Multi-camera with 4 x GigE

Bayer pattern

raw histogram

error-corrective values are close to zero

Normal distribution

Gaussian, Laplace

The top one is adding one bit noise, and the second one is adding two bits noise... The bottom one is adding 8 bits.