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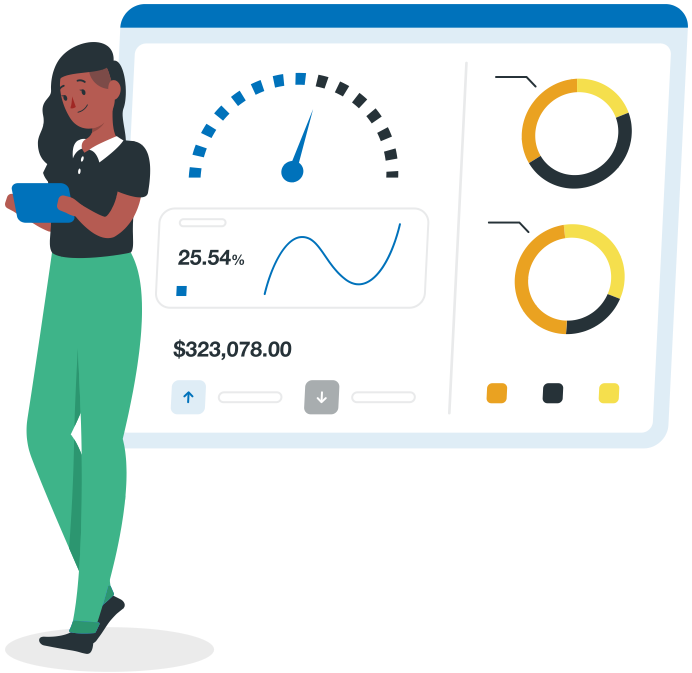

Image and Video compression

CSLP Group 1 - 2023/2024

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Our Solution

01

BitStream

Performs sequential bit read/write operations on the given files

02

Golomb

Transforms the given integer values into a stream of bits using Golomb codes

03

IntraCoding

Encodes and decodes frames using intra-frame algorithms

04

InterCoding

Encodes and decodes frames using inter-frame algorithms

05

HybridCoding

Encodes and decodes frames using inter-frame and intra-frame algorithms

06

FramesReader

Processes a YUV 4:4:4 video file by examining each frame in a sequential manner.

Functions and Settings

LossLess Hybrid

Perform encoding/decoding for every frame by considering both the current and preceding frames.

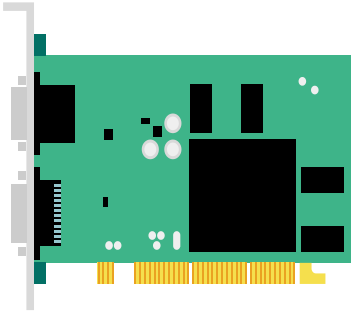
Vs

Lossy Hybrid

Apply quantization to the encoded values, sacrificing some information to enhance compression rates.

Testing and Parameters

Hybrid Lossless Encoder



Search Area

Size of the search area motion for estimation

Hybrid Lossy Encoder

Search Area

Size of the search area for for motion estimation

Quantization

Quantization level

Block size determined by greatest common divisor of video width and height, with ‘m’ parameter of Golomb dynamically calculated

Compression Rate (Hybrid Lossless)

	Search Area 3	Search Area 4	Search Area 5	Average
ducks_take_off	27.5538%	27.6515%	27.6866%	27.630%
park_joy	25.641%	26.5043%	27.137%	26.427%
in_to_tree	36.1457%	37.0794%	37.8557%	37.0269%
old_town_cross	37.9687%	38.7677%	34.5419%	37.0927%

Compression Rate (Hybrid Lossy)

Results based on the Search Area 3

	Quantization 2	Quantization 25	Quantization 50	Quantization 100
ducks_take_off	36.7468%	30.618%	29.5166%	27.7793%
park_joy	35.5051%	27.2502%	26.5972%	25.6626%
in_to_tree	44.4366%	40.9035%	38.253%	36.7377%
old_town_cross	45.5193%	43.1246%	39.5652%	37.9847%

Encoding Time (Hybrid Lossless)

	Search Area 3	Search Area 4	Search Area 5	Observation
ducks_take_off	262.552ms	611.553ms	1068.3ms	Execution time is proportional to the search area, making a larger search area less efficient.
park_joy	268.018ms	620.02ms	1074.57ms	
in_to_tree	256.971ms	604.646ms	1053.03ms	
old_town_cross	258.386ms	600.785ms	1047.91ms	

Encoding Time (Hybrid Lossy)

Results based on the Search Area 3

	Quantization 2	Quantization 25	Quantization 50	Quantization 100
ducks_take_off	242.2ms	253.697ms	263.719ms	278.546ms
park_joy	242.889ms	256.047ms	263.126ms	271.32ms
in_to_tree	252.453ms	257.134ms	268.197ms	283.697ms
old_town_cross	233.557ms	238.791ms	246.546ms	262.712ms

Decoding Time (Hybrid Lossless)

	Search Area 3	Search Area 4	Search Area 5
ducks_take_off	87195ms	86329ms	86808ms
park_joy	89384ms	89034ms	87314ms
in_to_tree	82786ms	80621ms	80427ms
old_town_cross	80283ms	81571ms	80531ms

Decoding Time (Hybrid Lossy)

Results based on the Search Area 3

	Quantization 2	Quantization 25	Quantization 50	Quantization 100
ducks_take_off	80763ms	91702ms	99064ms	109979ms
park_joy	69814ms	77865ms	88856ms	90901ms
in_to_tree	81440ms	94227ms	99486ms	96950ms
old_town_cross	60247ms	66179ms	74526ms	79984ms

Thank You!