



**universidade
de aveiro**

Departamento de Eletrónica Telecomunicações e Informática
Complementos Sobre Linguagens de Programação

Image and Video compression

Alexandre Cotorobai - 107849
Bernardo Figueiredo - 108073
Joaquim Rosa - 109089

Professor António J. R. Neves
Professor Armando J. Pinho
Professora Lúcia Sousa

Janeiro de 2024

1 Introduction

Building on the foundations of the lossless intra-frame and inter-frame encoder, the last deliverable introduces a lossy hybrid encoder. This evolution integrates both intra-frame and inter-frame coding strategies, allowing for enhanced compression efficiency. Parameters such as block range become integral to the encoder's flexibility. Real-time estimation for intra or inter mode adds a dynamic element to the compression process. As we venture into this deliverable, the focus is on achieving optimal compression ratios and processing times while minimizing the loss of quality. This deliverable extends the compression framework to incorporate lossy coding. This development introduces parameters for quantization shifts, providing control over the compression. The quantized values are entropy coded using Golomb codes, offering a versatile approach to lossy compression. As we implemented this extension, our attention was directed towards understanding the trade-offs between quantization and compression ratios. We aimed to achieve a good balance, offering flexibility in coding choices.

2 Results

These are the results obtained from the Hybrid Encoder and Hybrid Decoder that was developed for this project. The tests aim to evaluate the time performance and compression performance of both by varying different parameters. The parameters that were varied are the predictor, the block range, the shift and the period. The predictor is the predictor used in the Hybrid Encoder, the numbers 3,4,5,6,7 correspond to the following predictors JPEG Predictor 4,5,6,7 and LS. The block range is the range of blocks that are used to predict the current block in the Inter Encoder. The shift is the number of bits that are shifted that enables lossy compression. The period is the timeframe between Intra encoded frames.

3 Conclusion

Based on the results obtained, we can conclude the most favourable parameters are with the following inputs, Predictor=5, Block Range=5, Shift=4 and Period=0 with 31128ms (+/- 2.18 min) of Encoding Time and 539702845 bytes (+/- 539.7 MB) Encoded File Size and, Predictor=6, Block Range=5, Shift=4 and Period=0 with 126548ms (+/- 2.11 min) of Encoding Time and 579888870 bytes (+/- 579.9 MB) Encoded File size, with the original file sizes being around 1.4GB.

Table 1: Encoding Results

Predictor	Block Range	Shift	Period	Time	Size of Encoded File (bytes)	Compression Ratio
3	5	0	0	180310ms	932656188	1.48
3	5	4	0	134003ms	655613510	2.10
3	5	0	15	483657ms	961805192	1.43
3	5	4	15	581041ms	1001048015	1.38
3	10	0	15	1417639ms	961275004	1.43
3	10	4	15	1891661ms	1000087124	1.38
4	5	0	0	174478ms	910777694	1.51
4	5	4	0	144767ms	867165632	1.59
4	5	0	15	429734ms	937105774	1.47
4	5	4	15	576038ms	1015425512	1.36
4	10	0	15	1190152ms	937085503	1.47
4	10	4	15	1827465ms	1014464620	1.36
5	5	0	0	178905ms	944127781	1.46
5	5	4	0	131128ms	539702845	2.56
5	5	0	15	500716ms	972825966	1.42
5	5	4	15	577398ms	992639545	1.39
5	10	0	15	1450060ms	972408594	1.42
5	10	4	15	1884999ms	991678653	1.39
6	5	0	0	174864ms	931129881	1.48
6	5	4	0	126548ms	579888870	2.38
6	5	0	15	478601ms	955838379	1.44
6	5	4	15	579503ms	995973252	1.38
6	10	0	15	1390180ms	956489285	1.44
6	10	4	15	1861620ms	995012361	1.38
7	5	0	0	194050ms	911314241	1.51
7	5	4	0	156938ms	877505455	1.57
7	5	0	15	444555ms	937793179	1.47
7	5	4	15	592020ms	1016805896	1.35
7	10	0	15	1187682ms	937771548	1.47
7	10	4	15	1880242ms	1015845005	1.36

Table 2: Decoding Results

Predictor	Block Range	Shift	Period	Decoding Time
3	5	0	0	152179ms
3	5	4	0	122693ms
3	5	0	15	122032ms
3	5	4	15	100647ms
3	10	0	15	122280ms
3	10	4	15	100672ms
4	5	0	0	148173ms
4	5	4	0	138283ms
4	5	0	15	125579ms
4	5	4	15	101043ms
4	10	0	15	124776ms
4	10	4	15	101134ms
5	5	0	0	156374ms
5	5	4	0	118274ms
5	5	0	15	121721ms
5	5	4	15	100229ms
5	10	0	15	121802ms
5	10	4	15	100175ms
6	5	0	0	149995ms
6	5	4	0	119461ms
6	5	0	15	122156ms
6	5	4	15	100690ms
6	10	0	15	122241ms
6	10	4	15	100010ms
7	5	0	0	182089ms
7	5	4	0	150631ms
7	5	0	15	146162ms
7	5	4	15	103098ms
7	10	0	15	142517ms
7	10	4	15	102163ms