

Project #5: Image Compression

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Introduction

A digital image is a collection of pixel values representing intensity of the point in corresponding spatial location. Image compression and decompression serves to efficiently store amount of data required to represent a digital image. In this project, lossless image compression is implemented using a mixture of algorithms such as Huffman coding, Run-Length algorithm and bit slicing.

Solution

Implementation of this project consist three steps. Firstly, bit slice an image according to the bit positions and obtaining a binary representations of an image. Then, run-length algorithm was implemented to reduce same consecutive values and finally Huffman encoding was done to compress obtained values from previous algorithm. To increase the performance of the compression algorithm, all coding was done in C++ and OpenCV. Both of run-length and Huffman coding algorithms implemented by author, using data structure such as priority queue and object oriented programming to represent a tree for Huffman encoding.

Results

Here are the results obtained from the sample 16 bmp file images.

Image #	Compression Time (sec)	Compression Ratio	Decompression Time (sec)
1	12.3288	40.7434	15.4465
2	13.2824	32.2436	17.8165
3	14.0167	35.9862	17.9527
4	18.8841	12.8998	23.9278
5	18.3313	36.4344	23.6722
6	15.4716	47.7076	19.6006
7	18.4135	29.9066	23.8691
8	18.6934	36.0374	23.7393
9	17.3825	42.4063	21.5919
10	10.0922	41.4106	13.1904
11	11.7952	50.2756	12.245
12	9.79742	44.6388	15.6014
13	9.94913	43.6554	12.7754
14	15.9696	38.6746	20.0572
15	17.7849	31.4908	21.1062
16	17.986	30.1156	22.5994

Average compression time is 15.011 seconds.
Average redundant data is 37.164%.
Average decompression time is 19.07 seconds.