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08/30/19
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Image and Audio Compression Analysis

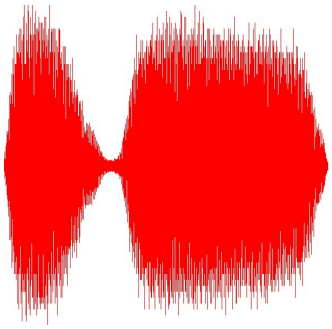
Audio Analysis

For the DCT algorithm for 1D, I tried to structure my design around linear algebra operations such as vector matrix multiplication, computing the transpose of a matrix, and computing the norms of vectors. To figure out the values for Cu, I first constructed a q matrix that excluded the Cu and A input vector from R-8 space. After computing the q matrix, I determined each Cu value by taking one column at a time from the q matrix and computing the norm for each vector in the q matrix. I stored these in an array for future use. Next, I recomputed the entire q matrix with the Cu values so that I that I had computed the equation given for the 1d DCT. With this new 8X8 matrix I performed a matrix vector multiplication with the input vector A from R-8 space and computed the coefficients for the vector C in R-8 space. If you determined the coefficients incorrectly, then you would get static noise in the output sound which is what I got the first time, until I debugged and found that I had computed the norm wrong for the Cu values and also messed up my indexing for the q transpose matrix for the inverse DCT.

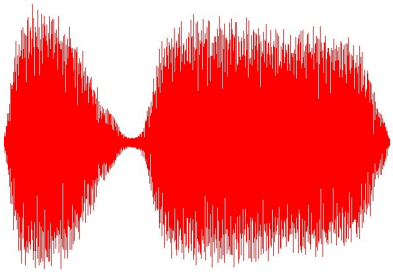
References

The first reference I would like to cite is Professor Kavan's amazing Linear Algebra videos on YouTube specifically lecture 13 on Transformations from the 2014 EAS playlist. The video was very helpful and inspirational when designing my matrix operations approach to solving for the Cu values for the 1D DCT Project and how to think about computing the q matrix and Cu values for the DCT. The second reference I would like to cite is Computerphile's videos on the DCT. These videos went deeper on the application of how the DCT works with some really cool examples similar to the ones Professor Kavan demonstrated in lecture on 08/26/19 and how the DCT is used in JPEG.

Uncompressed Audio



Compressed Audio



Uncompressed Cameraman

Compressed Cameraman