

Homework 1 - DCT

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Audio DCT

in order to complete the homework assignment for the audio DCT, I first read the assignment and looked over the code in main.cpp. After reading the assignment instructions and the code that was given, I had a pretty good understanding of what I needed to accomplish based on the lecture given in class on how to compute the DCT for the audio compression.

From the given formula for the audio DCT it is clear that 2 loops are needed. I understood that the input array was given and that I needed to calculate the DCT coefficients. I started by making two for loops.

Because we need to sum of the computation for each block, I knew that I needed to initialize each block to zero before computing the coefficient. I then compute the $c(u)$ and used the formula to compute the coefficient sum.

The tricky part was making sure that I was using the correct increments/counters in my formula that were in my loop. I figured out that the $c(u)$ and u and $C[i]$ coefficient given in the formula would use the first loop counter. the i in $2i + 1$ and in $A[i]$ would use the second loop counter for the computation.

I figured out that some of these would change in the inverse DCT computation. for example the $c(u)$, u now used the second counter and the i in $2i + 1$ used the first.

afterwards I needed to finish the compression. I used a single loop for the compression and used the m variable instead of $size$ because it was less passes in the loop and easy to compute.

Image DCT

Based on the lecture in class and the formula given in the assignment, I knew that four loops were needed to compute the DCT and inverse DCT for the Image. My understanding of the assignment came from reading the code and the assignment and looking at the Audio DCT

and the differences the Image presented.

I started with 4 loops, and i knew, just like the audio dct, that the coefficient array index had to start at zero and then receive a sum of computations. I then calculated $c(u)$ and $c(v)$ similarly using the i and j from my first 2 loops. these same counters were also used as u and v in the formula. I used the k and l from my last 2 loops in the x and y place in the formula.

the Inverse DCT was similar to the audio inverse DCT, had to use the same 4 loops and swap some of the variables/counters.

in the image compression 2 loops are needed to loop through all indexes in the C array. I used the $C[i*8+j] = 0$ if $i+j > m$ and that would zero the coefficients that are not needed.

No external resources or help was used when I did this assignment

*if further explanation is needed based on the foregoing, please let me know.