CPSC 635 - Assignment 1

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Part 2: Moving to Images

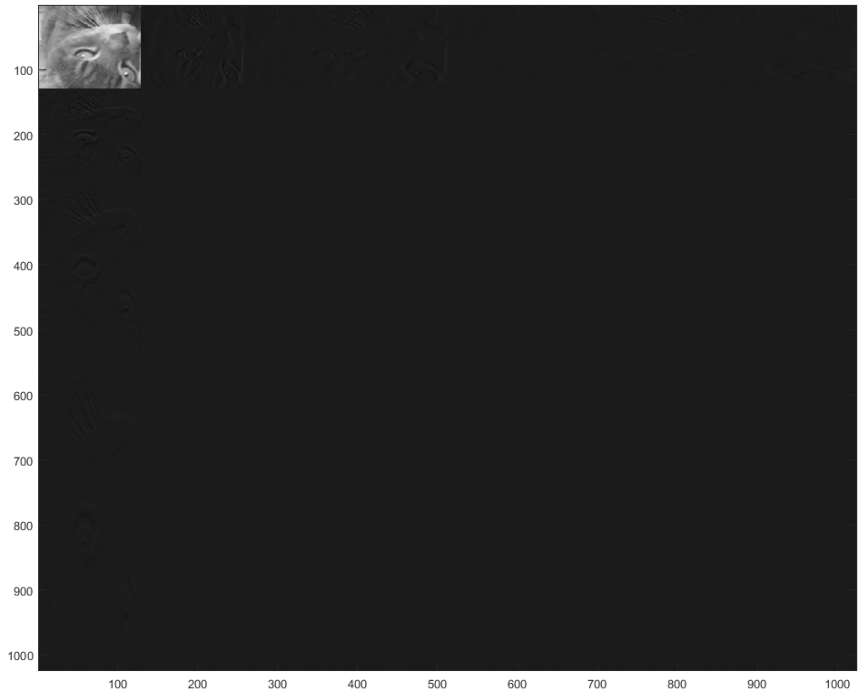

Figure 1: Three Haar decompositions of cat.png

- In the first 2 decompositions, the removed high-frequency data looks like a dark gray field with little variation. However, the removed high-frequency data from

the 3^{rd} and final decomposition is close in detail to the original image, but with darker grayscale values.

- The range of the removed high-frequency data is 0.2199, the min is -0.1167, and the max is 0.1032. When these are scaled and displayed in the image, they take the values: range $= 54.6028$, min $= 0$, max $= 54.6028$. This makes the data appear dark gray with little variation when displayed with the `image` function.

- The three Haar decompositions have reduced the size of the image by a factor of 2^{-3} (from 1024×1024 pixels to 128×128 pixels). However, much of the high-frequency data has been removed. Thus, Haar decomposition is a good technique for image compression as long as the loss of the high-frequency data is not important. If the high-frequency noise is to be retained to later decompress the image, then there are no storage savings.

- The Haar decomposition can only be done until the remaining low-frequency data has size 1×1, given that the image size is a factor of 2^n and n decompositions are performed. This would be done if the user wanted to remove all high-frequency data from the image.