Dynamic Image Compression Engine

(D.I.C.E)

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Abstract

Approximately 75% of all images online are compressed using JPEG encoding. JPEG is a lossy compression method, which removes information to save space when storing the image at the cost of image quality. Roughly 5% of images are stored using PNG, a lossless image format which does not throw away any information, providing higher image quality, but at the cost of larger file sizes. Newer formats such as AVIF have focused on either improving lossy quality or lossless file size. However, these newer formats have a fundamental limitation; requiring that a single encoding method is used for the entire image, limiting the potential size and quality gains. Newer AI based methods seek to overcome these limitations by synthesizing new information, allowing for extreme compression ratios and good image quality. However, these approaches are not yet viable due to their high processing requirements. Our approach aims to solve the tradeoff between file size and image quality by employing a hybrid format that combines lossy and lossless compression in the same image. We achieve this through a custom design hardware-based image processor and image format. By utilizing application specific hardware, we are able to achieve exceptional processing performance with very low power. By extracting key statistics from input images, we are able to algorithmically determine what encoding methods to use for a given section of an image. Encoded images are finally decoded and analyzed on a host PC to demonstrate the efficiency and performance of our processor and format.