

C00 Exercise 3: summarise

Ramana Kumar (rk436)

November 1, 2010

Image compression using sparse colour sampling combined with non-linear image processing by Brooks, Saunders, and Dodgson

The human eye is more sensitive to shapes than colours, so images with imperfect colours can look good. This suggests a method for compression: store just enough colour information to recover full colour imperfectly. Algorithms for adding colour to greyscale originals already exist. Brooks et al. investigate the application of two such algorithms to image compression.

The first algorithm, named colorization, assumes adjacent pixels with similar luminance are likely to have similar colours. Colorization propagates the colour information given for a small subset of pixels. The second algorithm, joint bilateral filter (JBF), combines two images by using one to guide noise removal in the other. JBF blurs away noise in a highly compressed colour image without bleeding over the edges preserved by a less compressed greyscale.

Brooks et al. use JPEG to compress luminance and either evenly spaced coloured pixels (colorization) or high compression JPEG (JBF) for colour. They compare the recoloring methods to JPEG at quality to match compressed file sizes. By varying the number of coloured pixels or the quality of the colour image, they cover a range of compressed file sizes, up to a compression factor of 400. For colorization, comparison is by Peak Signal to Noise Ratio (PSNR); for JBF, by visual inspection.

Colorization was better than JPEG on images with large areas of smooth colour, but worse on images with fast colour variation. Degradation in PSNR with increasing compression was often linear, like for JPEG, but was erratic in an image with large monochromatic areas. Whereas JPEG generates blocky artefacts, colorization produces a smoother image with washed-out colour.

JBF showed improved luminance detail over JPEG, using space left over from highly compressing colours. JBF also showed fewer colour shifts, but sometimes lost vividness. The computational cost of JBF is higher than of JPEG.