Information Technology and Software

The Estimated Spectrum Adaptive Postfilter (ESAP)

Enhancing images and videos without additional overhead in data stream

In the early 1990s, with the advent of web browsers and HDTV, NASA GSFC approved developing the Estimated Spectrum Adaptive Postfilter (ESAP) as an adaptive digital image processing tool that could enhance upcoming standardized digital JPEG imagery, MPEG video, and HDTV at very low bit rates (less than 0.25 BPP). Since these digital technologies can be scaled down to accommodate the low bit rates needed in constrained bandwidth space exploration applications, ESAP can be used to compensate for these low bit-rates, where applicable.

BENEFITS

- Improves compression factor (CF) for images and videos
- Improves JPEG CFs > 100:1 vs. 10:1*
- Improves MPEG/HDTV CFs > 200-500:1 vs. 50:1*
- Enhances subjective and objective quality of image
- No additional overhead in data required

technology solution

THE TECHNOLOGY

ESAP looks into the decoded JPEG image and determines the location of the edges of the image. An edge is the spatial transition from lets say, a human face to a landscape background or the silhouette or cartoon of a person or object. In the areas away of the edges, ESAP performs adaptive filtering to remove the pixelation (or blocking artifacts) created by highly compressed JPEG images. In general, ESAP improves both, the subjective visual quality of highly compressed JPEG images, as well as their objective quality measure known as the Peak-Signal-to-Noise Ratio (PSNR), as compared to baseline JPEG images. It does this without requiring any additional overhead in the data stream.

The low-resolution JPEG image (left) is enhanced (right) using the ESAP algorithm method

APPLICATIONS

The technology has several potential applications:

- To send small-size enhanced images from planetary rovers at low very bit rates
- Enhance JPEG images and MPEG video clips for smartphones and PCs/tablets
- (i.e. facetime, skype, webcasts, youtube, and video telecons at very low bit rates)

PUBLICATIONS

Patent No: 6,760,487

Patent Pending

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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