JPEG XL

DICOM Supplement 232

Benefits of JPEG XL

- Significantly smaller images for WSI
  - Lossy compression for WSI has been accepted by regulators using JPEG
  - Safari and Firefox both support JPEG XL
- Supports lossy >8 bit compression
- Ability to forward migrate into JPEG XL without any loss of fidelity with existing JPEG, as a safe migration option with full backwards compatibility
- As DICOMweb response is multiframe at much higher quality than gif
- As lossless web response, is much smaller than PNG and easier to decode
- Works well for both natural and synthetic images

Issues with JPEG XL

- As of 2024, not supported in all browsers, mitigated by WASM javascript modules (still zero footprint)
  - Supported natively in Safari
- Acknowledge potential effect of any lossy compression on CAD AI or quantitative algorithms.
- Patent issue that had occurred with Microsoft was determined to not be relevant by the JPEG XL community

Experience with WSI with JPEG XL (2024)

- Limited testing with JPEG XL at Mayo (6 months overall, 3 months concerted)
- No visual difference from what is seen, with 50-60% smaller
  - Multiple tiles, not all in one file
- Site has 40 million slides
- Very interested in the lossless transcoding from JPEG to JPEG XL
- Testing is not exhaustive yet
- Both multi-resolution in a single file and separated files
- Profiling results show that JPEG XL is fast enough for decoding/encoding, but is not as fast as JPEG

Vendor Perspective

- WSI scanner vendors are interested in trying to generate JPEG XL directly
- Reduction in artifacts is important for algorithms processing, and is better with JPEG XL
- Streaming of data to both algorithms and viewers is important and better with JPEG XL
- Can render portions of a tile that are important first (progressive)
- WSI has archives several times bigger than radiology
  - Mayo ~ 4 petabytes of data per year
- May well be able to reduce quality to reduce size further without reducing machine or user quality as JPEG XL has lots of options with very few artifacts
- Working on multi-spectral and multiple z-depths already, which is not well supported, and adds another order of magnitude in storage size

DICOMweb Usage

- Need to add JPEG XL transfer syntaxes to DICOMweb
- JPEG XL provides an alternative to gif for multi-frame rendered
- JPEG XL is a logical extension to baseline JPEG, especially if easily supported in browsers.
- JPEG XL is useful for color/lossy images as a replacement for JPEG whereas the HTJ2K is not very good for lossy compression