

A new JPEG format for virtual reality, drones and self-driving cars

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Touradj Ebrahimi, head of JPEG. Credit: group©7tin.cn

The Joint Photographic Experts Group (JPEG), an international committee headed by an EPFL professor, has just unveiled JPEG XS. With this new format, the image-compression process uses less energy, and higher-quality images can be sent with low latency over broadband networks like 5G. JPEG XS will have applications in areas such as virtual reality, augmented reality, space imagery, self-driving cars and

professional movie editing.

Why do [virtual reality](#) headsets make users nauseous? One reason is latency, or the almost imperceptible amount of time it takes for a display image to change in response to a user's head movement. However, the Joint Photographic Experts Group (JPEG) has just introduced a new image compression standard that could resolve this problem. This working group is headed by Touradj Ebrahimi, a professor in EPFL's School of Engineering (STI).

With JPEG XS, images and videos maintain an extremely high level of quality thanks to a compression process that is simpler and faster – and thus more energy efficient. The compressed files end up being larger, but that's not a problem thanks to broadband networks such as Wi-Fi and 5G: the aim is to stream the files instead of storing them in smartphones or other devices with limited memory.

This means that you could use your smartphone, tablet or computer to project a high-definition movie or a video game onto a large-screen display almost instantaneously. No cables would be required, and the image quality would be extremely high.

"We want to be smarter"

"For the first time in the history of image coding, we are compressing less in order to better preserve quality, and we are making the process faster while using less energy," says Professor Ebrahimi, who runs EPFL's Multimedia Signal Processing Group. "We want to be smarter in how we do things. The idea is to use less resources, and use them more wisely. This is a real paradigm shift."

JPEG compression, which has been widely popular over the past 25 years (see inset), typically reduces image file sizes by a factor of ten.

This compression process was developed so that images could be stored in cameras, with their limited memory, and easily shared over communication networks. Yet the process needs to evolve in response to new applications, more efficient broadband networks and technological advances. The JPEG XS standard compresses files by no more than a factor of six and is not meant to replace the popular JPEG format. "Compressing the images with JPEG XS doesn't compromise quality at all: even experts can't tell the difference between an original and a compressed picture or movie," adds Ebrahimi.

10 to 15 billion. That's the estimated number of JPEG images shared daily over social media around the world.

25 years. That's how many years have gone by since the first JPEG standard was created to store and send highly compressed images.

10. The typical image compression ratio with JPEG.

Wide array of applications

JPEG XS could come in handy whenever images and videos need to be sent to a processor as fast as possible. Potential applications include the "eyes" of drones and self-driving cars – technologies where long latency represents a danger for humans.

The new format has also attracted the attention of the European Space Agency (ESA). The low-power algorithms used by JPEG XS would be a boon for space probes, which need to take very high-quality photos using

only a tiny source of energy. Smartphones and other everyday devices with limited memory will continue to use the legacy JPEG format to store pictures.

Another advantage of JPEG XS is that, like all previous JPEG formats, it is open-source. The Society of Motion Picture and Television Engineers (SMPTE), based in Hollywood, is already considering adopting JPEG XS as its editing format. "With JPEG XS, professional movie editors can take images created with different devices and import them directly into their editing software," says Ebrahimi. Currently, every brand of video camera that uses high-dynamic-range (HDR) imaging techniques has its own proprietary coding format. That means individual files must be transcoded before they can be edited. JPEG XS will change this situation by providing a universal format.

In addition to coordinating the development of the JPEG family of standards, Professor Ebrahimi came up with a new evaluation methodology together with his team in order to assess how well JPEG XS performs. These tests proved that the technological side of the new format is sound. The multimedia industry is currently awaiting final approval by the member states of the International Organization for Standardization (ISO). Once that is obtained, JPEG XS-based products and services can be launched.

"In the immediate future, JPEG XS will be put to use in professional applications like movie editing, space imagery and professional-grade cameras. Consumer electronics will come next, including [self-driving cars](#), virtual reality, augmented reality, and wireless connections between multimedia devices and TV monitors or projectors," says Ebrahimi. "To be able to use JPEG XS, consumers will need to own the next generation of devices. In terms of software, they will probably just need to run an update, like they do from time to time on their computers and smartphones anyway."

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