The New Video Compression In Your Pocket

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Most people aren't even aware of the fact that they have a new method of image compression sitting in their pocket that will likely become the future of IP CCTV. The questions that need to be answered are, what is it, how does it work and why is it so much better?

The latest iOS on your Apple smartphone and iPad includes a new method of image compression inside the camera functionality. If you take pictures and then view them on the smart device itself, you probably won't notice anything unusual. However, when you export these images to your computer, you may notice a new file format with an 'HEIC' extension as opposed to the traditional 'JPEG' of years gone by.

The HEIC extension refers to a compression method known as High Efficiency Image File Format (HEIF). This is a component of the new High Efficiency Video Compression (HEVC) standard, popularly known in the CCTV industry as H.265.

The HEIF (High Efficiency File Format) is a new image compression format developed by the MPEG imaging experts in 2015. It is now used by Apple as a default image compression in

their latest iOS operating system (starting from v.11). Google is planning to include the same method of compression in their latest Android OS.

The HEIC format refers to a form of image compression that involves compressing both horizontal and vertical pixels in still images, making it two dimensional. The HEVC format refers to a video compression which deals with motion images (three-dimensions: horizontal x vertical x time) and sound.

The HEIC file format can be decoded by newer operating systems, beginning with Mac OSX High Sierra (v.10.13), Mojave (v.10.14) and Windows 10 (v.1803 and later).

Since the new compression formats are very new, some users may find it challenging to open and edit such photos or videos with their default (older) photo-editing programs on their computers.

In the Mac OSX, this can be done automatically by the native Preview app, while for Windows a dedicated machine, software needs to be installed. Such programs are iMazing or Apowersoft Photo Viewer. It is also possible to switch the

smart devices to use the "Most Compatible" format (under the Settings > Camera > Formats) which will re-set the image format back to JPG. It is worth noting that professional photo editing software, like Adobe Light-Room, have already come up with an HEIC plug-in.

JPEG compression has existed since 1992, and as such JPG decoders are embedded in all known software which needs to decode JPG images, such as web browsers, word processors, and email programs. Since HEIC is a very new form of compression, when sending the HEIC image file as an email attachment, the latest iOS operating system automatically converts it to JPG. This function will eventually be made redundant once the HEIC becomes more common.

HEIF not only increases the efficiency, but also the quality of the compression algorithms. As the name suggests, the 'high efficiency' coding means that for the same picture quality you would get from JPG compression, the HEIC would be a much smaller file size.

Saving space with the HEIC file format is only one of

the advantages, and reasons, for switching to it. Another advantage of HEIC is its ability to compress a sequence of images (like a 'burst shot' function when taking 'live pictures' with your iPhone). You can also save auxiliary data, such as the depth map used in Face Cam when unlocking your smartphone. Depth map is also useful in image processing with dual camera smartphones, where digital blurring of the background is performed by the software processing, simulating a narrow depth of field effect for more appealing portraits.

Furthermore, the HEIF compression uses 16-bit colours, instead of 8-bit colours as used with JPG. This makes colour images with gradual colour transition, like blue sky, appear smoother and more natural; blocky artefacts – typical to JPG – become less obvious.

Admittedly, there is a price to pay for such an increase in efficiency in HEIC compression, and that is more number crunching, and more coding and decoding processing. With more modern, super- fast processors, this is hardly noticeable as

processors now supersede their capacity on a daily basis.

When comparing an HEIC with a JPEG compressed image, the typical ratio file size ration is 1:2 for the same image quality.

This means, a standard 12MP image from an iPhone, which (depending on the content) would occupy around 2~3MB in JPG, will only be around 1~2MB using HEIC to compress the same visual quality.

Most people today use their smartphones for picture taking on a daily basis on all occasions, privately and professionally, this requires a large amount of data space. This is the main reason that many iPhone users always need extra space on their devices. However, with the update to the latest operating system, they can take more pictures and videos, on the same device, consuming much less space, yet offering the same image quality.

For illustration purposes, I have prepared some screen-shots of the ViDi Labs test chart, compressed in JPG and HEIC format. The images are made with a 'standard' 12MP 1/3 sensor of an iPhone7 using a 'standard' 4mm lens.

IMG_4253.TIF	43.4 MB	Today at 15:13	Today at 15:13	TIFF image
IMG_4249.JPG	2.4 MB	Today at 15:12	Today at 15:12	Affinity Openable
IMG_4248.HEIC	1.2 MB	Today at 15:11	Today at 15:11	High Efficiency Image File Format

IMG_4248.HEIC
4,032×3,024

IMG_4249.JPG
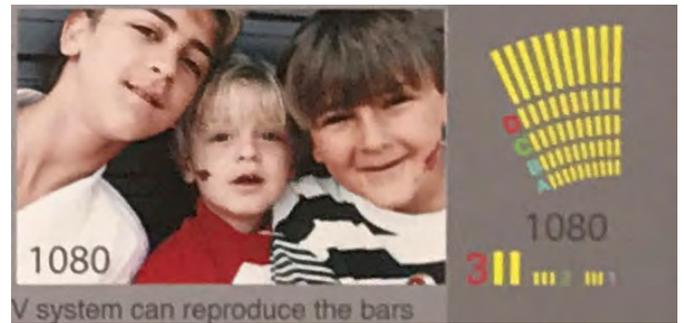4,032×3,024

IMG_4253.TIF
4,032×3,024

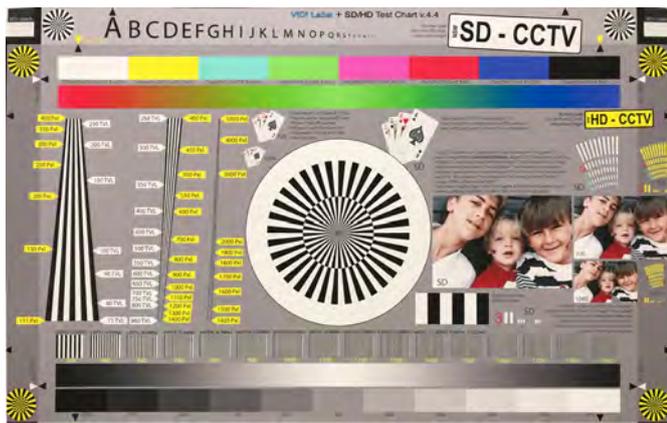The ViDi Labs test chart in TIFF format (16-bit) = 43.4MB uncompressed!

The ViDi Labs test chart in JPEG format (8-bit) = 2.4MB

The small detail crop. Please note the reasonably sharp numbers 2 and 1 on the right hand side.
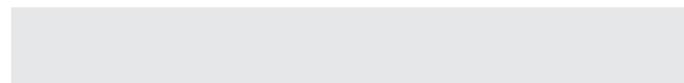

The small detail crop. Please note the blurred numbers 2 and 1 on the right hand side.

The ViDi Labs test chart in HEIC format (16-bit) = 1.2MB

The small detail crop. Please note the numbers 2 and 1 on the right hand side, although blurrier than the TIFF image, appear slightly sharper than the JPEG format.

For comparison, I have also produced an uncompressed TIFF format of the same test chart using a special iPhone software that allows for an uncompressed image.

The uncompressed 12MP image produced in 16-bit RGB colour space TIFF format occupies around 43.4MB of data.

The equivalent JPG produced of the same test chart image was around 2.4MB. This is nearly 20x smaller than the TIFF! It is not surprising that users prefer JPG compression rather than uncompressed TIFF format, for very little loss in quality.

The equivalent HEIC format is literally half of this, 1.2MB, and it is almost impossible to notice any loss of detail compared with the JPG.

The ViDi Labs test chart has many small details and after careful inspection I could not see any difference, between the JPG and HEIC files, despite them being 2:1 in file size. There is a tiny bit visible difference between the TIF file and the JPG and HEIC, where the TIF looks slightly sharper, as it would be expected (being uncompressed). This is shown further in the cropped pictures.

Offering such data saving, there is no doubt that HEIC will soon be used in the modern IP CCTV cameras. ∎

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