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COMMON ASSESSMENT TASK

Level 1 Digital Technologies, 2019

91887 Demonstrate understanding of compression coding for a chosen media type

Credits: Three

Achievement Criteria		
Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of compression coding for a chosen media type.	Demonstrate in-depth understanding of compression coding for a chosen media type.	Demonstrate comprehensive understanding of compression coding for a chosen media type.

Type your School Code and 9-digit National Student Number (NSN) into the header at the top of this page. (If your NSN has 10 digits, omit the leading zero.)

Make sure that you have the scenario page.

Answer all parts of the assessment task in this document.

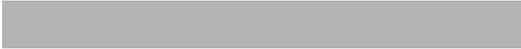
Your answer should be presented in 12pt Arial font, within the expanding text boxes, and may only include information you produce during this examination session.

You should aim to write between **800–1500 words** in total.

Save your finished work as a PDF file with the file name used in the header at the top of this page ("SchoolCode-YourNSN-91887.pdf").

By saving your work at the end of the examination, you are declaring that this work is your own. NZQA may sample your work to ensure that this is the case.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.



INSTRUCTIONS

The assessment task in this document relates to compression methods for ONE media type (audio, image or video).

The separate scenario page includes two options for you to choose from.

Read the scenario page and the assessment task before you begin. **All your answers must be based on the same media type** from your chosen option.

Type the scenario (A, B or C) in the space below:

B

Type your chosen option from the scenario (audio compression, image compression or video compression) in the space below:

Image
Compression

Begin your answers on page 3.

ASSESSMENT TASK

- (a) Explain in detail and justify the format(s) you use for your chosen scenario. Common recording formats include:
- for audio: WAV, MP3, AIFF, WMA
 - for image: RAW and JPEG
 - for video: 1080p, MP4, AVI, WMV.

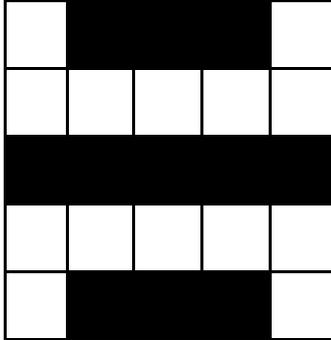
For photography the Big Sing event I would have the cameras set using RAW file format. This is due to the fact that RAW captures all data from the photograph and loses no information. There is no compression algorithms when images are taken in RAW form. Due to the fact that RAW images are the collection of original data with no modification. This means that RAW images can then be turned into any other file formats due to them containing all the data in an Image. However RAW images have a significantly large file size due to the fact that no compression occurs meaning that every single data is stored taking up large amounts of space on the camera for a single image. However as there is a team of students taking photos each using their own camera, There will be enough images taken by each student over the course of the event even with the increased file size.

Why I would not use save the photos as JPEG on the cameras is due to the fact that JPEGs use lossy compression to reduce their file size, This means that the cameras would be able to store more photos of the event. The size decrease comes with a price, the lossy compression algorithm reduces the quality of the image, meaning that the image will lose it's quality making for a less nicer looking image. This also means due to the lossy compression the image cannot be converted to other file formats as some data is lost when it is being compressed.

(b) Explain how files of your chosen media type can be represented using bits in an uncompressed form.

Image files can be represented using bits. A bit is a single value that can be represented as on or off, which can be represented with a 1 and a 0 respectively. A byte is a sequence of 8 bits which can be used to represent a higher value. The simplest way to represent an image using bits would be a black and white image.

For this example and others I will be using this image for my examples.



A simple image like this is called a bitmap and its file ending is shortened to bmp.

A way to represent this image would be to simply have 0 to represent squares with white as their colour and 1 to represent black as their colour. Such as:

0	1	1	1	0
0	0	0	0	0
1	1	1	1	1
0	0	0	0	0
0	1	1	1	0

When storing this image you would always need 25 bits to represent it. Due to the file being uncompressed this means that every single data is stored so no matter what the image looks like an image of this size would always be 25 bits.

When displaying coloured images, a pixel is used. A Pixel is a grouping of 3 sub pixels each with an assigned colour (Red, Green, Blue). Each coloured subpixel is assigned a value between 0 and 255 to designate the shade of this colour. Since a byte is a sequence of 8 Bits, using the binary counting system we can have 256 different values (2^8) using a singular byte. This means that each subpixel is assigned a singular byte to store its colour shade. With a pixel being 3 bytes of information this means each pixel has a range of 16.7 million colours (256^3) This gives us the colour gradient which is used to represent coloured images.



255	255	255	255	255
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
255	255	255	255	255
0	0	0	0	0
255	255	255	255	255
0	0	0	0	0
255	255	255	255	255
255	255	255	255	255
255	255	255	255	255
0	0	0	0	0
0	0	0	0	0
255	255	255	255	255

White being represented with no colour (all values 0) and black being represented as all the colours (all values being 255). This means that 75 bytes are needed to represent this coloured image. This is a small image compared to the High quality images taken during the Big sing event which has massive ranges of colour. This means that the file sizes are going to be large due to every single byte being individually stored to maintain quality.

(c) Explain the reasons why files of your chosen media type might be compressed.

Why files may be chosen to be compressed is due to the fact that the image file size would be quite large without compression this means that less images can be stored due to space limitations. By compressing an image file you reduce the size of the file. There are two types of image compression, Lossy and Lossless. Lossy image compression when it compress images lose data to make the image smaller in the process losing quality to the image as well due to some of the data being lost. An examples of image formats that use lossy compression is JPEG. Lossless compression is a method that maintains the quality of the image and loses no data in the compression of the image. The main way it compress the image is by losing colours that the human eye cannot see. The human eye can see about 7 million colours, a computer screen can display a significantly higher number than that, Lossless removes these colours so that the image size is smaller.. Due to this it means that it can be converted back into its original RAW file format to be converted into other image file formats. However you must be careful when using a lossless compression algorithm on an Image, In some cases the compressed file size may in fact be larger than the uncompressed file size as lossless compression algorithms cannot be used universally.

A simple example of lossless compression is run-length encoding. Run-length encoding can take a simple black and white image and significantly reduce the bits needed to represent the image.

Run-Length encoding work by counting the number of same coloured bits in a row, always starting with 1 (Black), This image can be represented as:

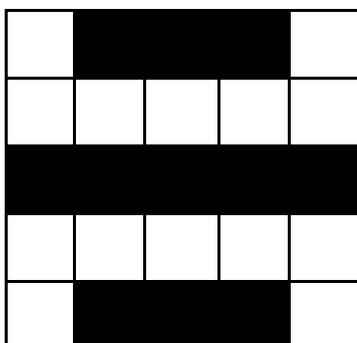
0,1,3,1

0,5

5

0,5

0,1,3,1



When converted each number to binary you get

0,1,11,1

0,101

101

0,101

0,1,11,1



This only requires 21 bits to encode this image. This is saving from the first example as of 25 bits we can work out that 21 is 84% of 25 meaning that we saved 16% of space by compressing the image. Other images have different compression rates with some images being more optimal than others.

- (d) Explain how lossy file compression can affect media quality from an end-user's perspective.

Lossy image file formats can lessen the quality of an image. This is due to when lossy compression compress file formats it loses data in the image compression process. This means it significantly reduces file size as it removes parts of the image and then recreates it as best as possible so that humans can't tell the difference. An example of an Image format that uses lossy compression is JPEG. However whenever you open a JPEG and save it as a new file again, the Compression algorithm repeats on itself compressing the image even more. So when strenuous editing occurs with a JPEG The image would lose more and more quality each time the image is saved. This means that the Image would lose its crispness and the end-user viewing the image wouldn't get a very nice looking image. The end image would be very blurry and most likely have artefacts. Artefacts being a result of it being compressed too many times leaving marks on the image looking unnatural.

- (e) Referring to your chosen option for the scenario, select ONE of the required outputs and type it in the space below:

Copies of the photo to be stored in the schools archive on the schools network

For this output, identify an appropriate type of compression method (either lossy or lossless), and then:

- explain why you would use lossless or lossy compression, outlining the advantages and disadvantages of compression for the output using this method
- justify your decision, explaining why your chosen compression method would be the most appropriate
- give examples of appropriate file types for the compression method.

I would use lossless compression for storage in the schools archive.

Advantages of lossless compression is the fact that the image remains high-quality and still has all of the data stored in the image. This means there is a High-Quality image which also saves on file space. Another advantage is if they need the image for other reasons, such as school promotional work. they can convert the image back to its RAW form to be converted into other image formats. A disadvantage of this file format is that even though the file is compressed, the compression is minimal so that the file size is quite large. This means that the images still take up a large amount of space compared to lossy compression.

Why I chose to use lossless compression is because of the school archive needing the best quality of images available. This is because the school would likely use the images at a later date, for any range of uses, By having high quality images they would be able to repurpose these images for any range of uses. Lossless also has the ability to convert back into its RAW form allowing it to be converted into any other image format giving it a wide variety of uses. Due to the fact that the images are being stored on the school network. The school network would have a quite large server for storing all the schools data. So the larger file size isn't as much as a problem as the school already has a significantly larger place to store them. Why I wouldn't choose lossy is because of it losing data when it is compressed this means that the image wouldn't be of a high enough quality to repurpose for other uses. File formats that use lossless compression that would be appropriate for storage on the School Archive is PNG. This is because PNG is optimised for Computer use meaning that when you are viewing the file from a computer screen you can clearly see if it will suit your purposes, and because of it being a lossless image format it can be converted to other image formats which would suit their use a lot more.

Merit Exemplar 2019

Subject	Digital Technologies		Standard	91887	Overall grade	06
Q	Grade	Annotation				
		<p>The candidate chose an appropriate compression format for their selected scenario. They justified their decisions and included comparisons to other file types to support their decisions. They showed understanding of how uncompressed data could be represented using bits. Their explanation of why files captured in their chosen media type might be compressed showed a clear understanding of the technical aspects of compression, with detailed examples of how this affected the end user. The candidate's explanation of lossy compression showed an understanding of the effects of lossy compression. However, they failed to demonstrate a technical understanding of how lossy compression worked. The candidate chosen an appropriate file type(s) for their selected output scenario and justified their decisions. They explained the advantages and disadvantages of potential file types that could be used, taking into account end-user requirements.</p>				