ARTSTUDI 168
ANJA UTFELDT
JEN LUO

COMPRES SION / DECOMPR ESSION

IMAGE LOSSINESS, TRANSFORMATION, AND DIGITAL MEMORY

A DIGITAL IMAGE IS RECORDED AS A MATRIX
OF NUMBERS.

$$n \begin{bmatrix} & & \\ & & \end{bmatrix}^{n}$$

IMAGE COMPRESSION USES A DIFFERENT BASIS TO
ACHIEVE A REASONABLY APPROXIMATION
OF THE IMAGE.

THIS IS THE HAAR WAVELET BASIS.

$$H = \begin{bmatrix} 1/2 & 1/2 & 1/\sqrt{2} & 0 \\ 1/2 & 1/2 & -1/\sqrt{2} & 0 \\ 1/2 & -1/2 & 0 & 1/\sqrt{2} \\ 1/2 & -1/2 & 0 & -1/\sqrt{2} \end{bmatrix}$$

IT BREAKS A NXN ARRAY OF PIXELS INTO BLOCKS OF SIZE 4X4 AND ASSIGNS A MATRIX TO EACH BLOCK.

LET'S USE THE HAAR WAVELET BASIS TO COMPRESS A 4X4 IMAGE.

$$Image = \begin{bmatrix} 1 & 1 & 9 & 9 \\ 2 & 2 & 11 & 11 \\ 9 & 9 & 1 & 1 \\ 10 & 11 & 1 & 2 \end{bmatrix}$$

$$compressed\ image = \begin{bmatrix} 22.5 & 0 & 0 & 0 \\ 0 & -17 & 0 & 0 \\ -2.1 & 0 & 0 & 0 \\ -1.4 & 0 & 0 & 0 \end{bmatrix}$$

$$decompressed\ image = H\ (compressed\ image)\ H^{-1}$$

$$= \begin{bmatrix} 0.6 & 0.6 & 9.1 & 9.1 \\ 2.1 & 2.1 & 10.6 & 10.6 \\ 9.4 & 9.4 & 0.9 & 0.9 \\ 10.4 & 10.4 & 1.9 & 1.9 \end{bmatrix}$$
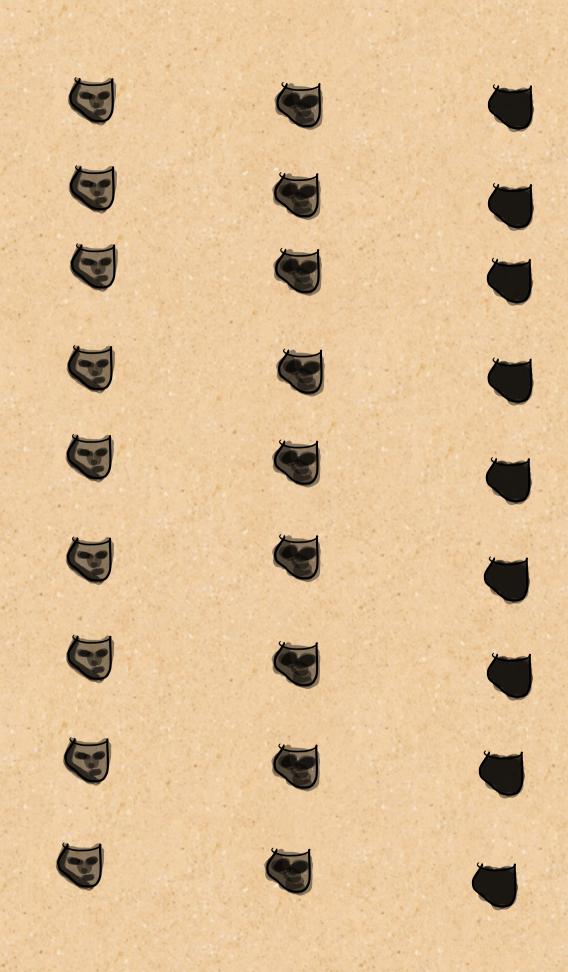
WE'VE ACHIEVED A COMPRESSION WITH SOME LOSS.

$$\begin{bmatrix} 1 & 1 & 9 & 9 \\ 2 & 2 & 11 & 11 \\ 9 & 9 & 1 & 1 \\ 10 & 11 & 1 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 0.6 & 0.6 & 9.1 & 9.1 \\ 2.1 & 2.1 & 10.6 & 10.6 \\ 9.4 & 9.4 & 0.9 & 0.9 \\ 10.4 & 10.4 & 1.9 & 1.9 \end{bmatrix}$$

COMPRESSION RATIO DESCRIBES THE RATIO
OF NONZERO TO ZERO ENTRIES IN OUR
SPARSE COMPRESSED MATRIX.

STORAGE IS FINITE SO WE HAVE TO OPTIMIZE.

I SCANNED 9 FACES TO RENDER 3D MASKS.

USING DRACO, AN OPEN-SOURCE 3D COMPRESSION
SOFTWARE, I COMPRESSED/DECOMPRESSED 3 IMAGES
A TOTAL OF 90 TIMES USING A 14:1 COMPRESSION RATIO.

HOW MUCH IS LOST IF WE WERE TO
COMPRESS AND DECOMPRESS OUR IMAGES?

WHAT DOES COMPRESSION AND DECOMPRESSION
MEAN FOR OUR DIGITAL MEMORY?

WHAT WILL A DIGITAL ARCHIVE LOOK LIKE?