The Expected Indents

- [PeithonKing] (https://github.com/PeithonKing)
- [Grn] (https://github.com/CodeRulerNo1)
- [Zike] (https://github.com/Zike01)
- [BUSH] (https://github.com/BUSH222)
- [dha72] (https://github.com/dhananjaylatkar)

Image Processing Pipeline

We have majorly used the following image processing techniques:

- Singular Value Decomposition (SVD)
- Masking the image for penalty

Stay back and be prepared for some hardcore maths stuff!

Singular Value Decomposition (SVD)

Singular Value Decomposition (SVD) is a matrix factorization method used to decompose a matrix A into three constituent components.

$$A_{n\times m} = U_{n\times n} \times S_{n\times m} \times V_{m\times m}$$

The S matrix looks like this:

[where $\sigma_a > \sigma_b$ if $a > b$]

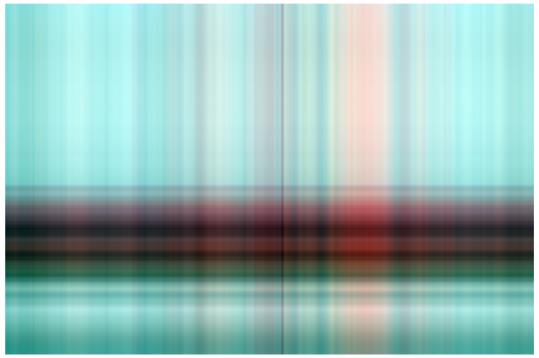
$$S_{n\times m} = \begin{pmatrix} \sigma_1 & 0 & \cdots & 0 \\ 0 & \sigma_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_m \\ 0 & 0 & \cdots & 0 \\ \vdots & \vdots & \cdots & \vdots \\ 0 & 0 & \cdots & 0 \end{pmatrix}$$

Reduction

As $\sigma_a > \sigma_b$ if $a > b$, the initial terms in S will have much more influence on the image than the later terms. So, instead of taking the whole S matrix, if we even take the first few terms, we will get a rough representation of the actual image.

Example in a color image

1 terms, size = 0.13%
of original image



5 terms, size = 0.65%
of original image

10 terms, size = 1.3%
of original image

20 terms, size = 2.61%
of original image

50 terms, size = 6.52%
of original image

100 terms, size = 13.04%
of original image

200 terms, size = 26.07%
of original image

500 terms, size = 65.19%
of original image

Use of SVD in our project

We needed a way to somehow keep the image obscure at the beginning and then gradually reveal it as the player guesses more and more correct letters. So we decided to keep on adding more terms to the image with each correct guess.

Masking the Image for Penalty

In this game scenario, a binary mask matrix is maintained, which is divided into square grids (in this case, each image is divided into 32x32 grids). Initially, all elements of the matrix are set to 1, representing a clear image. The objective is to obscure parts of the image as a penalty when the player guesses a wrong letter.

Gameplay

Next we would have a glance at the game itself.

Picturepuzzlers

Start Game

Please wait! Your game is being created...

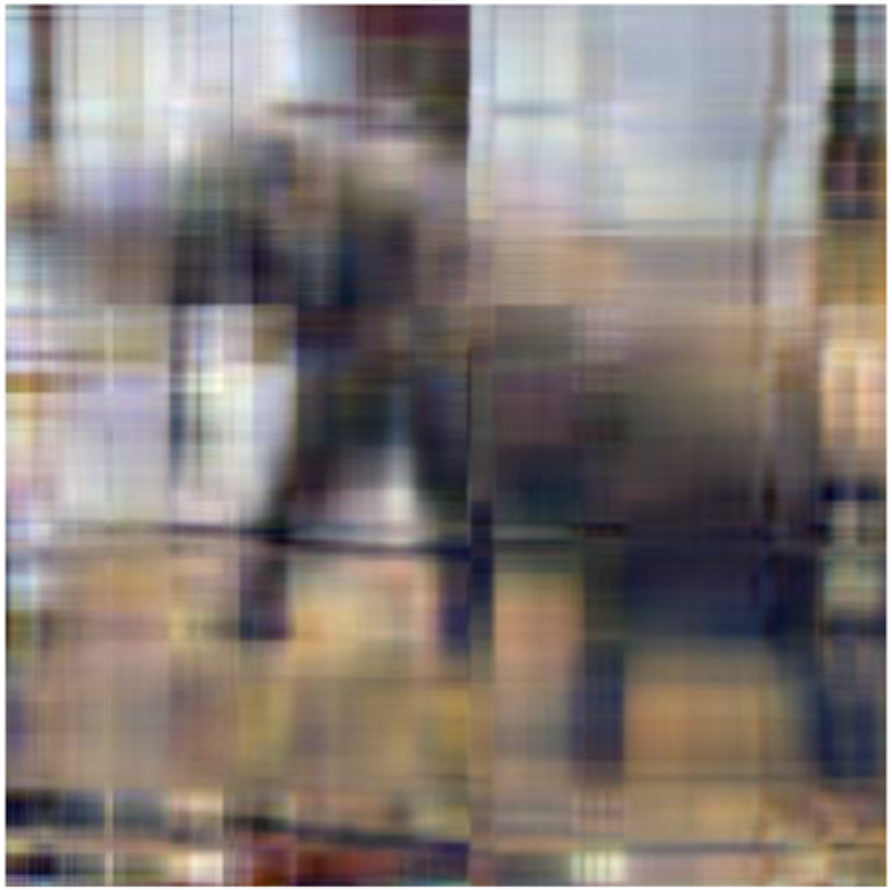
The Start Game Page

Picturepuzzlers

Lives: ❤️ ❤️ ❤️ ❤️ ❤️ ❤️

Game ID: odL2fx

Hint:



1 2 3 4 5 6 7 8

e _ e _ _ _ _ _

Enter a letter:

Guess

Correct guess!

Image Appears on correct guess

Picturepuzzlers

Start Game

Please wait! Your game is being created...

The Start Game Page

Thank You