Depix——a tool for recovering passwords from pixelized screenshots

Github Page: github.com/beurtschipper/Depix

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Introduction

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- Pixelization describes the process of partially lowering the resolution of an image to censor information.
- The **linear box filter** method is commonly used to implement pixelization, which is simple and works fast.
- A linear box filter takes a box of pixels, and overwrites the pixels with the average value of all pixels in the box.

Here is an illustation of the linear box filter:

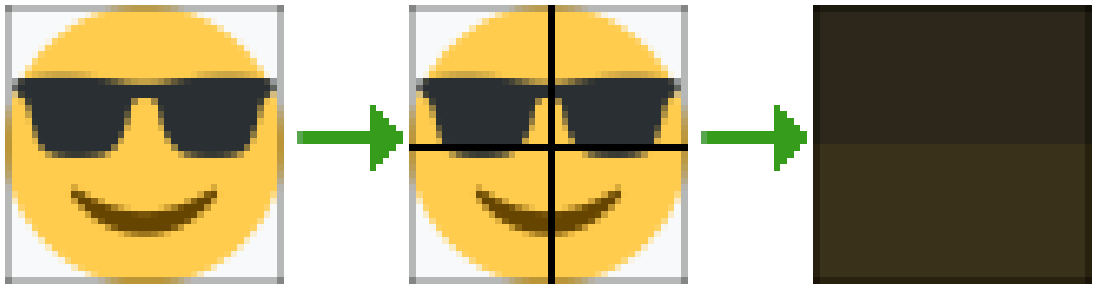

Figure: Illustration of the linear box filter.

Introduction

Depix is a tool for recovering passwords from pixelized screenshots, and the image below shows one of the test results.

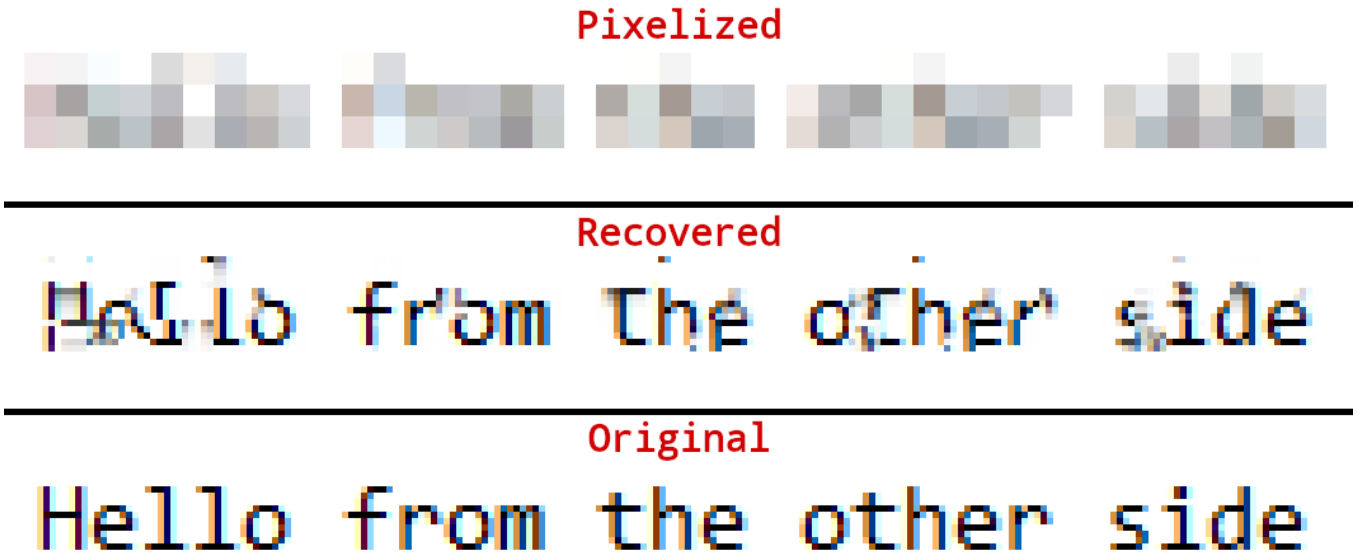

Figure: Test result of Depix.

Algorithm description

- Since the linear box filter is a deterministic algorithm, pixelizing the same values will always result in the same pixelated block.
- Pixelizing the same text - using the same locations of blocks - will result in the same block values.
- We can try to pixelate text to find matching patterns.
- This solution is quite simple: take a **De Bruijn sequence** of expected characters, paste it in the same editor, and make a screenshot of that. That screenshot is used as a lookup image for similar blocks.

Algorithm description

De Bruijn sequence

- In combinatorial mathematics, a **De Bruijn sequence** of order n on a size-k alphabet A, denoted by $B(k, n)$ is a cyclic sequence in which every possible length-n string on A occurs exactly once as a substring (i.e., as a contiguous subsequence).
- For example, taking $A = \{0, 1\}$, there are two distinct $B(2, 3)$: 00010111 and 11101000, one being the reverse or negation of the other.

Algorithm description

- Here is an example of De Bruijn sequence with $n = 2$ and $A = \{0 - 9\} \bigcup \{a - z\} \bigcup \{A - Z\}$.
- It's important that 2-character combinations are used, because some blocks can overlap two characters.

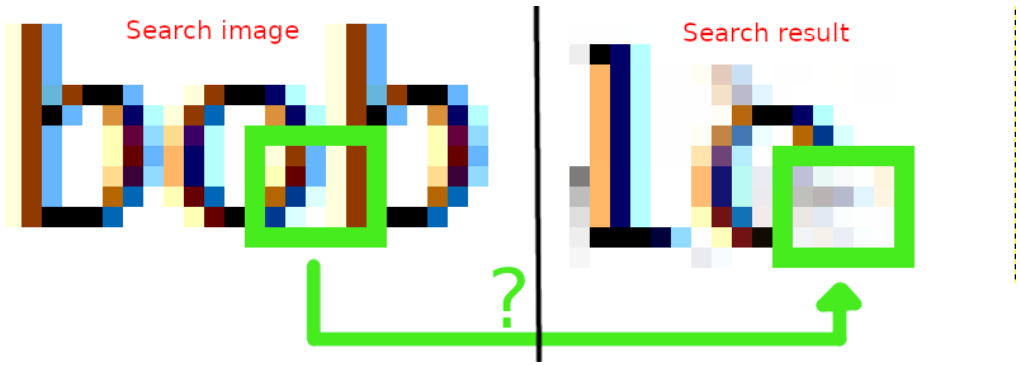

Figure: Search using De Bruijn sequence.

Finally, we show a test result in jupyter notebook[1].

[1] ssh-connection