Self-Embedding Watermarking System

Software Bug Report

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1. Bugs

The following are the few bugs that were noticed during development phase.

1.1 Image Watermark Loss

Submit by	Hunzlah Malik
Date Seen	February 2, 2022
Versions	- Windows 10 - Image Watermark Embedding
Bug Description	A watermarked image will lose the embedded data once its extension is changed, this is due to compression of image.
Severity	Major
Steps to Reproduce	1. Watermark an image through our system. 2. Change the extension of image e.g., if it is png, change it to jpg etc.
Actual Behavior	The image will not be able to detect any tampering.
Expected Behavior	When checked for authentication, it should determine whether the image is tampered or not.
Troubleshooting/ Testing Steps Attempted	Looked into various methods that would prevent loss of authentication and recovery bits when image extension is changed.
Workaround	The only workaround decided for now is to let the user know that image watermark will be lost of image extension is changed. A detailed solution would be out of the scope of this project.

1.2 Pixel-wise Image Watermark Bug

Submit by	Aashar Naseem
Date Seen	April 8, 2022
Versions	- Windows 10 - Python3
Bug Description	Image going through watermarking process was not being watermarked properly and hence it was not being authenticated properly.
Severity	Catastrophic
Steps to Reproduce	1. Run watermark function on a selected image. 2. Tamper the watermarked image. 3. Run authentication on tampered image and untampered image that has been watermarked.
Actual Behavior	It will show both images as tampered.
Expected Behavior	It should only show the tampered image as tampered and watermarked image as authentic image.
Troubleshooting/ Testing Steps Attempted	Debugged and reexamined the whole watermarking process along with the research paper.
Workaround	The issue was found in one of the bit sequences which was later on fixed.

1.3 Recovery Process in Pixel-wise Method

Submit by	Aashar Naseem
Date Seen	April 20, 2022
Versions	- Windows 10 - Python3
Bug Description	PSNR of recovered image is too low.
Severity	Catastrophic
Steps to Reproduce	1. Run watermark function on a selected image. 2. Tamper the watermarked image. 3. Run recovery process on the tampered image.
Actual Behavior	The recovered portion of image is too much distorted.
Expected Behavior	It should show the recovered area properly.
Troubleshooting/ Testing Steps Attempted	Revisited recovery bits embedding process along with calculations.
Workaround	Reimplemented recovery bits embedding process to ensure proper data is recovered.

1.4 Glitch in Video Recovery

Submit by	Usama Aslam
Date Seen	April 29, 2022
Versions	• Windows 10 • Python3
Bug Description	Video recovered using keyframe embedding process will feel glitchy when a large number of frames are tampered and it would be even more glitchy if the keyframe has been tampered or removed.
Severity	Catastrophic
Steps to Reproduce	1. Watermark video 2. Tamper video at any point 3. Perform recovery process on the video
Actual Behavior	The recovered video feels glitchy and stutters due to repeated duplication of keyframes.
Expected Behavior	It should show file name when hovered on the preview image
Troubleshooting/ Testing Steps Attempted	Looked into various solutions and research papers to check for a valid method that would ensure that video runs smoothly.
Workaround	Watermark all frames of a video instead of only the keyframe so that we would not need to duplicate keyframes when a normal frame is tampered.

1.5 Issue in Triple Recovery Watermark Process

Submit by	Hunzlah Malik
Date Seen	December 26, 2021
Versions	• Windows 10 • Python3
Bug Description	Image that has been cropped cannot be recovered because we would not be able to determine the original image size.
Severity	Catastrophic
Steps to Reproduce	1. Watermark image. 2. Tamper the image by cropping it from anywhere. 3. Perform recovery process.
Actual Behavior	Original image size might not be recovered.
Expected Behavior	Image should be recovered and original size should be preserved.
Troubleshooting/ Testing Steps Attempted	Looked into various methods that could be used to preserve original image size.
Workaround	Encoded image size as a multiple of 64 in the authentication bits hash by reducing hash size using a library called Blake2b.

1.6 Lookup Table Issue in Triple Recovery Method

Submit by	Arbab Hamd Rizwan
Date Seen	December 18, 2021
Versions	• Windows 10 • Python3
Bug Description	Our method claims that a tampered image can be recovered up to 75%, however if it is tampered on a few specific portions, it cannot be recovered even if it was tampered around 25%.
Severity	Major
Steps to Reproduce	1. Watermark an image. 2. Tamper an image on various selected portions such that all sub-blocks of a specific partner block are tampered. 3. Run recovery process.
Actual Behavior	It will be unable to recover original image even if tampering rate is 25%.
Expected Behavior	It should be able to full recover such tampered image.
Troubleshooting/ Testing Steps Attempted	Looked into the lookup table generation and compared it to sudoku.
Workaround	Created multiple variants of lookup table. When a user uploads image for watermarking, it also takes in a string as a password from user. This password is also used to generate an integer that will select a specific lookup table.

1.7 Uploaded Image Description Issue

Submit by	Arbab Hamd Rizwan
Date Seen	March 10, 2022
Versions	• Windows 10 • ReactJS Version 17 • Ant Design
Bug Description	Ant design image upload component was not displaying image description properly. In our case, it was image name, instead it would show html code when hovered.
Severity	Minor
Steps to Reproduce	1. Click the upload image box. 2. Upload image. 3. Hover on the preview image.
Actual Behavior	It will show some html code when hovered on the preview image.
Expected Behavior	It should show file name when hovered on the preview image
Troubleshooting/ Testing Steps Attempted	Tried editing the CSS of Ant Design built in component.
Workaround	Replaced the component with MUI image upload component.