DATA SECURITY USING SVD BASED DIGITAL WATERMARKING TECHNIQUE

NAME:HIBA NAFEESATH
ROLL.NO:20
PRODUCT OWNER:K P BALACHANDRAN

Table Of Contents:

DESCRIPTION:

Illegal misuse of copyright information such as forgery, manipulation and duplication is not uncommon. To prevent this digital watermarking techniques are widely used thus increasing the robustness and imperceptibility properties in a digital multimedia. The main objective of developing a digital image watermarking technique is to satisfy both imperceptibility and robustness requirements.Digital watermarking appears as an efficient means of securing multimedia contents such as copyright protection and authentication. In this paper a hybrid scheme using Singular Value Decomposition (SVD) and Discrete Wavelet Transform (DWT) is being proposed. SVD and DWT are matrix based operations, this hybrid method prevents convolution which would otherwise consume a lot of resources. Computation of a larger set of data occurs faster due to the use of SVD. A simple digital watermarking algorithm based on discrete wavelet transform and singular value decomposition has been proposed in this paper. This proposed method helps to understand basic concept of digital watermarking. Experimental results demonstrate the effectiveness of the proposed method. One of the major advantages of the proposed scheme is the robustness of the technique on wide set of attacks.

MODULES:

1.Data collection
2.Data Cleaning
3.Training
4.Testing
5.Result Generation

METHODOLOGY

The objective of this project is to develop a watermarking scheme which is based on cascading DWT with SVD. DWT decomposes the image into four frequency bands: LL band which represents low frequency, HL and LH representing middle frequency and HH represents high frequency band. LL band gives approximate details. In this proposal, we select LL band to embed the watermark because it contributes significantly to the robustness of an image. Thus it can survive certain image processing operations like noise addition, intensity manipulation, etc. In this SVD based watermarking scheme, instead of embedding the watermark directly on the wavelet coefficients SVD transformation is applied to the whole image and then the singular values of the host image are modified to embed the watermark.

A. Watermark Embedding

- Watermark W is decomposed using SVD

$$W = U_W \times S_W \times V_W^T$$

- Using Haar wavelet perform first level decomposition of the cover image: LL, HL, LH, and HH. SVD is then applied to LL band.

$$L = U_L \times S_W \times V_L^T$$

- The singular values of the LL band are replaced with the singular values of the watermark. After applying inverse SVD we obtain modified LL band.

$$L' = U_L \times S_L \times V_L^T$$

- Inverse DWT is applied to produce the watermarked cover image.
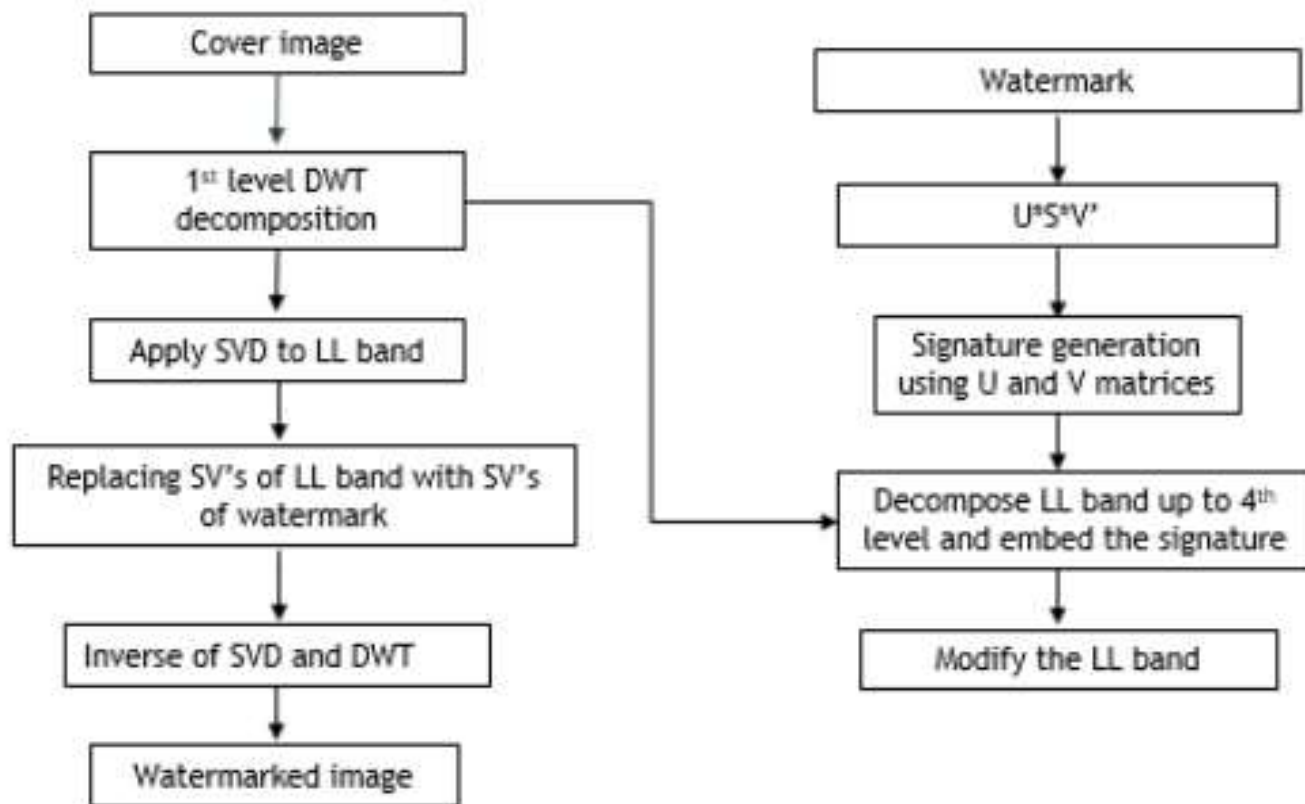
Fig 1.a Watermark embedding block diagram

B. Watermark Extraction

- Using Haar wavelet, the noisy watermarked image is decomposed.
- SVD is applied to LL band

$$L = UL \times SL \times VL\ T$$

- Then extract the singular values from LL band.
- The watermark is constructed using singular values and orthogonal matrices UW and VW obtained using SVD of original watermark.

$$WE = UW \times SL \times VW\ T$$

CONCLUSION

       In this project a blind watermarking scheme has been proposed which combines SVD along with DWT. The watermark embedding and extraction algorithm were successfully implemented using vs code.This method proving its robustness property. This hybrid technique is better than some of the existing methods such as DWT-DCT and pure SVD techniques.

FUTURE ENHANCEMENT

Tackling copyright issues, digital watermarking comes out as suitable solution. Digital watermarking is process of inserting watermark information into host image. Watermark is the copyright information which protects digital data from the illegal replication and distribution.

DEVELOPING ENVIRONMENT:

❖ <u>Hardware specification:</u>

    Processor : Intel Pentium Core i3 and above

    Primary Memory : 4 GB RAM and above

    Storage : 500 GB hard disk and above

❖ <u>Software specification:</u>

    Language :Python

    Front end : Python Django

    Back end : SQLite

    Operating system : windows 7 and above

    IDE : Visual Studio code

    Others : HTML,CSS

    Algorithm:Singular Value Decomposition

    Technique:Watermarking Embedding & Extraction

PROJECT PLAN:

User Story ID	Task Name	Start Date	End Date	Days	Status
1	Sprint 1	20/4/2022	01/05/2022	2	Completed
2		01/05/2022	09/05/2022		Completed
3	Sprint 2	15/05/2022	18/05/2022	5	Completed
4		19/05/2022	22/05/2022		Completed
5		23/05/2022	28/05/2022		Completed
6		29/05/2022	01/06/2022		Completed
7	Sprint 3	02/06/2022	05/06/2022	3	Completed
8	Sprint 4	10/06/2022	04/07/2022	5	Completed

USER STORY:

User Story ID	As a <type of user>	I want to <perform some task>	So that I can <achieve some goal>
1	User	Collection of Dataset	Coco Dataset
2	User	Preprocessing of collected data(null values elimination)	Cleaned final dataset
3	User	UI designing(a form to enter news for checking)	UI designing
4	User	Visualisation of input image	Graphical representation of data
5	User	Applying watermark on image	Watermarked image
6	User	Split data into training & testing set	80% -training data & 20%-testing
7	User	SVD-DWT Algorithm	Decomposed values & original image,watermarked image
8	User	Generation of output	Informs whether copyright occurred or not

PRODUCT BACKLOG:

User Story ID	Priority<High /Medium/Low >	Size(Hours)	Sprint	Status<Planned/Inprogress/ Completed>	Release Date	Release Goal
1	Medium	2	1	Completed	01/05/2022	Collection of datasets
2	High	3		Completed	09/05/2022	Preprocessing of collected data
3	Medium	3	2	Completed	18/05/2022	UI Designing
4	High	2		Completed	22/05/2022	Graphical representation of data
5	Medium	5		Completed	28/05/2022	Watermarked image
6	High	5		Completed	01/06/2022	Train the data,
7	High	10	3	Completed	05/06/2022	Decomposed values & original image,watermarked image
8	High	20	4	Completed	04/07/2022	Output

SPRINT PLAN:

Backlog item	Status & Completion date	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13
User Story#1,2		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Data collection	01/05/2022	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Preprocessing	09/05/2022	3	0	3	0	0	0	0	0	0	0	0	0	0	0
User story #3,4,5,6															
Visualisation & Training	01/06/2022	15	0	0	3	3	3	3	3	0	0	0	0	0	0
User story #7															
UI Designing	05/06/2022	10	0	0	0	0	0	0	0	4	4	2	0	0	0
User story #8,9															
Testing	12/07/2022	20	0	0	0	0	0	0	0	0	0	0	8	6	6
Total		50	2	3	3	3	3	3	3	4	4	2	8	6	6

Sprint1 Actual:

Backlog item	Status & Completion date	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Completed<Y/N>
User Story#1,2		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Data collection	01/05/2022	2	2	0	0	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	09/05/2022	3	0	3	0	0	0	0	0	0	0	0	0	0	0	Y
User story #3,4,5,6																
Visualisation & Training	Planned	15	0	0	3	3	3	3	3	0	0	0	0	0	0	N
User story #7																
UI Designing	Planned	10	0	0	0	0	0	0	0	4	4	2	0	0	0	N
User story #8,9																
Testing	Planned	20	0	0	0	0	0	0	0	0	0	0	8	6	6	N
Total		50	2	3	3	3	3	3	3	4	4	2	8	6	6	N

Sprint2 Actual:

Backlog item	Status & Completion date	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Completed<Y/N>
User Story#1,2		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Data collection	01/05/2022	2	2	0	0	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	09/05/2022	3	0	3	0	0	0	0	0	0	0	0	0	0	0	Y
User story #3,4,5,6																
Visualisation & Training	01/06/2022	15	0	0	3	3	3	3	3	0	0	0	0	0	0	Y
User story #7																
UI Designing	Planned	10	0	0	0	0	0	0	0	4	4	2	0	0	0	N
User story #8,9																
Testing	Planned	20	0	0	0	0	0	0	0	0	0	0	8	6	6	N
Total		50	2	3	3	3	3	3	3	4	4	2	8	6	6	N

Sprint3 Actual:

Backlog item	Status & Completion date	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Completed<Y/N>
User Story#1,2		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Data collection	01/05/2022	2	2	0	0	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	09/05/2022	3	0	3	0	0	0	0	0	0	0	0	0	0	0	Y
User story #3,4,5,6																
Visualisation & Training	01/06/2022	15	0	0	3	3	3	3	3	0	0	0	0	0	0	Y
User story #7																
UI Designing	05/06/2022	10	0	0	0	0	0	0	0	4	4	2	0	0	0	Y
User story #8,9																
Testing	Planned	20	0	0	0	0	0	0	0	0	0	0	8	6	6	N
Total		50	2	3	3	3	3	3	3	4	4	2	8	6	6	N

Sprint4 Actual:

Backlog item	Status & Completion date	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Completed<Y/N>
User Story#1,2		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Data collection	01/05/2022	2	2	0	0	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	09/05/2022	3	0	3	0	0	0	0	0	0	0	0	0	0	0	Y
User story #3,4,5,6																
Visualisation & Training	01/06/2022	15	0	0	3	3	3	3	3	0	0	0	0	0	0	Y
User story #7																
UI Designing	05/06/2022	10	0	0	0	0	0	0	0	4	4	2	0	0	0	Y
User story #8,9																
Testing	Planned	20	0	0	0	0	0	0	0	0	0	0	8	6	6	Y
Total		50	2	3	3	3	3	3	3	4	4	2	8	6	6	Y

Thank you