# COPYRIGHT APPLICATION FOR DIGITAL IMAGE BY USING SVD WATERMARKING TECHNIQUE (SINGULAR VALUE DECOMPOSITION)

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## *ABSTRACT*

*Developments in the digital world and other devices that digital world, has made digital data are widely used, Along with the ever-expanding multimedia network, the process of delivery and access of digital data is also increasingly easy. With the ease of this course, each person can freely exchange the information they want. However, on the other hand this brings new problems in terms of ownership for a given data such as original image or also called Copyright.*

*One method developed to solve the problem is digital watermarking.Watermarking is a form of steganography (a technique for hiding information on a medium without any significant change in the media) using the method of Singular Value decomposition (SVD) in the watermarking process in which this method is a technique used by correlation value of the extracted watermark*

*This application is tested with data type image in various sizes, as well as test results from the process of watermarking and watermark Scanning process. The test results showed that the application be better used on file with the type of image data. Jpg and. Bmp because PNSR value generated is higher than other image data types.*

*Keywords: watermarking, Data Images, SVD method, Extraction.*

## I. INTRODUCTION

### I.1 Background

Developments in the digital world and other devices that digital world, has made digital data are widely used. There are several factors that make the digital data (such as audio, image, video, and text) is widely used, among others:

1 Easily duplicated and the results are similar to the original
2 Cheap to storage to copy and
3 Easily stored for later processing or further processing,
4 And easily distributed, both with the media disks or through networks like the Internet.

Especially with the development of Internet technologies that can serve and unite the various types of digital data, digital data is increasingly used to establish a multimedia system. With the Internet as the world's largest network system that connects nearly all the world's computers, make all the computers in the world is increasingly easy to exchange data. In the "Mayan World" is, almost any kind of information can be obtained, all it takes is a computer connected to this virtual world (internet).

Along with the ever-expanding multimedia network, the process of delivery and access of digital data is also increasingly easy, with the ease of this course, each person can freely exchange the information they want.However, on the other hand this brings new problems in terms of ownership for a given data such as original image. Various types of digital processing methods for copyright protection of digital data already available today. One method developed to solve the problem is digital watermarking.Watermarking is a form of steganography (a technique for hiding information on a medium without any significant change in the media.)Watermarking Techniques will insert the digital information called watermark into

a digital data called a carrier. The inserted watermark can be plain text, audio, image or video depends on the ability of the host media. The addition of a watermark into a multimedia content without affecting their quality can be used as an authentic proof of ownership of data. For the security of confidential information is one of the ways that information will be encrypted before it is inserted into the digital media and then extracted and described the return of digital media.

At present many methods used for watermarking techniques. Among others, such as the Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT) and Singular Value decomposition (SVD), For the time being has been widely used method of DWT (Discrete Wavelet Transform), which prior to the watermarking process, digital image data will be processed through the analysis conducted through the signal moves to get some information, while the method of Singular Value decomposition (SVD) is a technique used by the correlation of the extracted watermark, where the watermark correlation value will be tested for the level of watermark strength (robustness) afterexperienced various kinds of image signal processing (attack) such as the addition of process noise filters, scaling, rotation, cropping and compression, to test the strength of the watermark against various kinds of signal processing will be compared to the application of these two methods in watermarking technique in which the media used as the carrier is Digital Images and information that could be inserted in the form of text and images.

From the description above, taken Topic for final project Building a Security Application Data Copyright for Digital Image Watermarking Technique Using the method of SVD (Singular Value decomposition)

## I.2 Problem Identification

Based on the background issues that have been described, the identification of problems in this thesis are:

1. How to build an application that is used for security Copyright Digital Data
2. How to test the strength of watermarking techniques using SVD ( Singular Value decomposition )

## I.3 Objective and Purpose

### I.3.1 Objective

The purpose of this research is to build an application to perform on the image watermarking technique using SVD (Singul ar Value decomposition).

### I.3.2 Purpose

The purpose of this study are:

1. Building Applications watermarks (Wate rmark) on a digital photo work.
2. Watermark Extraction of building applications that have been insertedwatermark image where the image has been given the attack.
3. Developing applications that can protect the Digital Image Copyright.

## I.4 Research Methodology

The methodology undertaken in this final include the following:

1. Method Literature Review of collected data through literature studies ofreference books and journals related. Literature study is a phase ofdeepening the material, identification of issues and theories related toproblems in research.
2. Methods Experimental Study of a planned experiment in analyzing, applying the method SVD (Singular Value decomposition) on Watermarkin g,the results of the analysis and perancangan tersebut will be implementation and testing.

### I.4.1 Software Development

The method used in developing software is the waterfall method (Software Engineering, Roger.S.Pressman, Ph.D., Third Edition). The stages contained in the waterfall model can be seen in Figure 1.1

a. Needs Analysis
   Gather complete requirements then ana lyzed and defined the needs that must be met by the application to be built. This phase should be done in fullorder to produce the complete design.

b. System Design
Translation stage of the purposes or analyzed data into a form that is easily understood by the user or users. The design software is actually a collectionprocess that is focused on 4
(four) different attributes on
the program, thedata structure, software architecture, the details of procedures, and interfacecharacteristics. The design process, translate the needs into a softwarerepresentation that could be assessed quality before coding begins.

c. Implementation and Testing Unit
Translation Stage data or solving problems in the codes that have beendesigned into the computer programming language specified.

d. Testing System
Phase unification program units are built and then tested as a whole.

e. Maintenance / Maintenance
The last stage of a software that has been completed can
undergo changesor additions such as adjustment for adaptation to the actual situation.

Figure waterfall process model can be seen in figure 1.1 as follows:

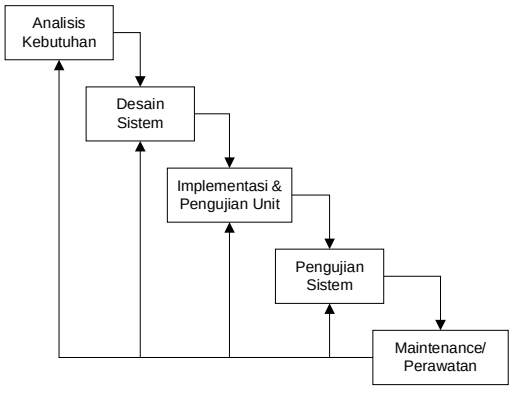



**Figure 1. 1 *Waterfall* Diagram [5]**

## II. Analysis and Design system

### II.1 System Analysis

The analysis system is a step that aims to understand the system, knowingthe strengths and weaknesses of the system in the review of the user. By analyzing the system procedures that are often used, then the system is often used can be evaluated so that it can be used as reference to build a new system of evaluation results. In this research, which will be analyzed is the stage to build applications of copyright protection for digital image data (digital image) and the discussion of watermarking technique to be used the method of SVD (Singular Valuedecomposition)

The system will be built is a system implemented using the method SVD watermarking technique for copyright protection for digital image data, so that the system must be constructed in accordance with the needs as follows:

**1.** Build applications that can perform copyright protection for digital imagedata.
**2.** Implement the watermarking technique using SVD method according to the stages in it.
**3.** Perform application testing to measure the performance of works incopyright protection for digital image data.

### II.2 Use Case Diagram

Use case diagrams are used to describe the expected functionality of a system. A use case represents an interaction between actors with the system. Use case diagram in Figure 3.8 that describes how the processes that occur on watermarking application data transfer.

#### II.2.1 Use Case Diagram For *Watermarking dan* Extraction

Use case diagram of watermarking and extraction process can be seen in Figure 3.8

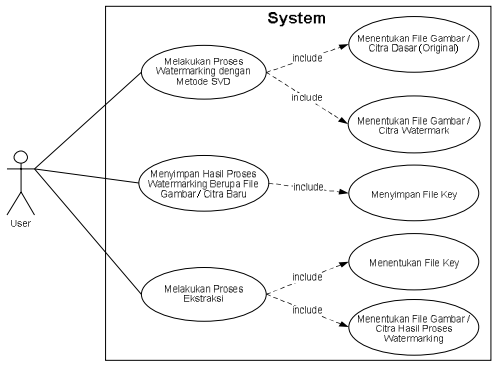



**Figure 3.8 Use case diagram for watermarking dan Image Extraction Process**

## II.3 Activity Diagram

Activity flow diagram describing the various activities within the system beingdes igned, how each flow starts, decision that may occur, and how theyended. Activity dia grams can also describe parallel processes that mayoccur in some execution. Activity diagram is a special state diagram where most of the state is the action and most of the transition is triggered by the completion of the previous state (internal processing). Therefore, activity diagram does not describe the internal behavior of a system (and interactions between the sub systems) are exact, but rather describes the processes and pathways from the level of activity in general. An activity can be realized by a single use case or more. Activities describe the processesrunning, while the use cases describe how actors use the system to perform the activity. Figure 3.9 and Figure 3.10 shows the activity diagram by the application.

### II.3.1 Aktivity Diagram For Watermarking

Activity diagram of the process of watermarking can be seen in

Figure 3.9

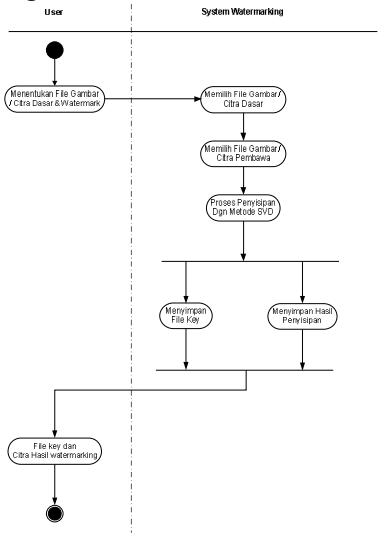



**Figure 3.9 Activity diagram for watermarking Process**

### II.3.2 Activity Diagram For Extraction

Activity diagram extraction process can be seen in Figure 3:10

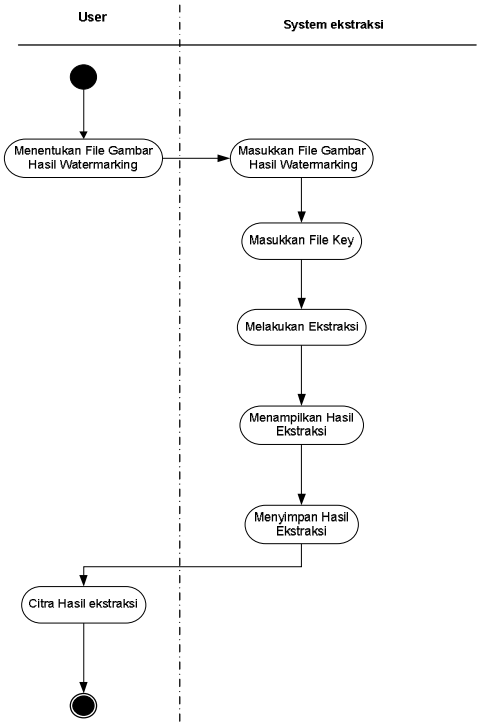



**Figure 3.10 Activity diagram for Extraction Process**

## II.4 Sequence Diagram

Sequence diagrams describe interacti ons between objects within andaround the system (including user, displays, and so on) in the form ofmessage that is described with respect to time. Sequence diagrams consist Atar vertical dimension (time) and horizonta l dimension (related objects).

Sequence diagram is used to describe a scenario or series of steps undertaken in response of an event to produce a given output. Starting dariapa that to trigger the event, the process and what changes occurinternally and what the resulting output.

Sequence diagram depicted in system design can be seen in Figure 3.11 itpicture 3.12.

### II.4.1 Sequence DiagramWatermarking

Sequence diagram of the general process of watermarking can be seen in Figure 3:11

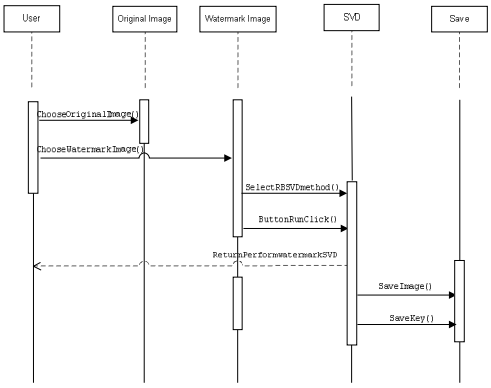



**Figure 3.11 Sequence diagram For watermarking Process**

### II.4.2 Sequence Diagram Ekstraksi

Sequence diagram of the general process of Extraction can be seen in Figure 3:11

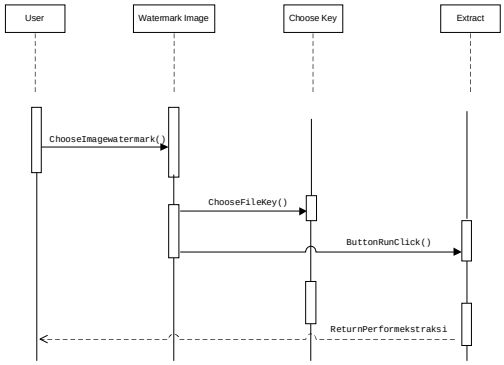


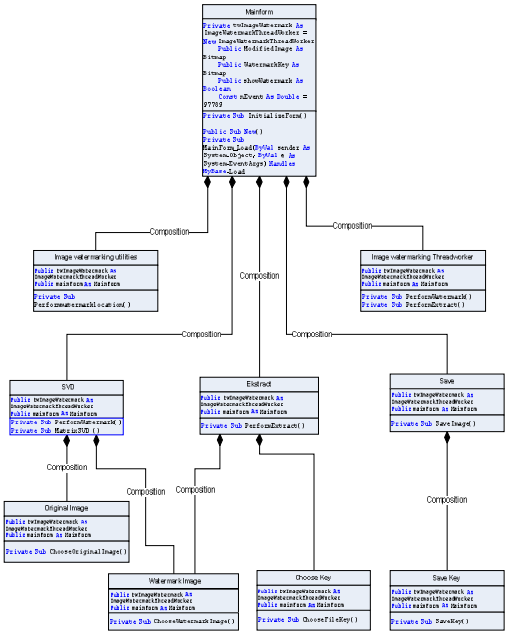

**Figure 3.12 Sequence diagram For Extraction Process**

## II.5 Class Diagram

Class diagram describes the state of a system (attribute), and providing service to resolve the situation (method). Class diagrams can be seen in Figure 3:13.

### II.5.1 Class Diagram Watermarking dan Ekstraksi

Class Diagram Watermarking and Ex traction Process The process can be seen in Figure 3:13




**Gambar 3.13 Perancangan Class**

### II.6 Inteface Design

Interface design is needed to represent the actual circumstances of the application to be built, will be presented following the design of the interfaceof the application to be built:

### II.6.1 Watermarking Menu

Watermarking menu interface is used to make the process of watermarking the files. Figure 3.14 shows the design of watermarking menu.

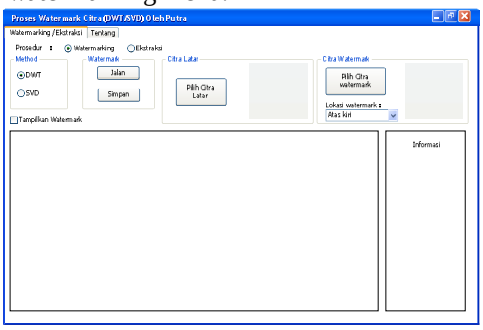


**Figure 3.14 Watermarking Interface Design**

### II.6.2 Extraction Menu

Menu interface extraction is used to perform the extraction process the file. Figure 3:15 shows the design of Extraction menu.

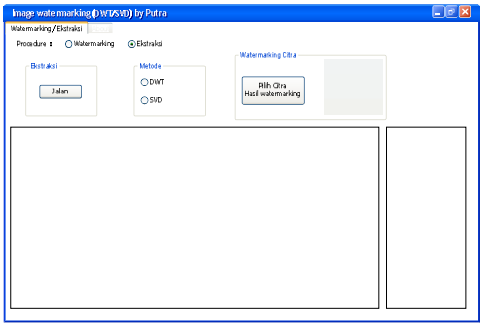


**Figure 3.15 Extraction Interface Design**

### II.6.3 About Menu

About the menu interface is used to display information about software and software developers. Figure 3.16 shows about the menu design.

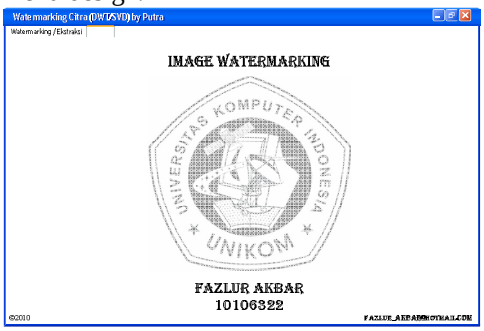



**Figure 3.16 About Interface Design**

### II.6.4 Error Message

Error message interface is used to display a warning that there has been an error in the use of program. Figure 3:16 and 3:17 pictures featuring Design Error Message.

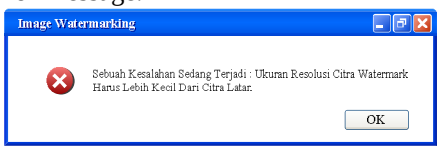



**Figure 3.16 First Error Message Design**




**Figure 3.17 Second Error Message Design**

## III. Implementation

### III.1 Program Implementation

Watermarking applications using DW T (Discreete Wavelet Transform) and the method of SVD (Singular Value decomposition) is built using Microsoft visual studio 2008.

Data compression program consists o f several menus. Among the main menu, menu compress, decompress menu. The main menu is the menu, which first appeared when the program is run. Here is a picture display of

each menu of applications that have been made.

### III.2 Perangkat Pendukung yang Digunakan

In the process of making the application of compression is, of course, need the hardware (hardware) and software (software). Here is a description of hardware and software used.

### III.3 *Hardware*

Minimum specifications of hardware used in test compression applicationsare as f ollows:

1. Processor AMD Athlon X2 5000 + @ 2. 60GHz
2. Memory 2 GB
3. Video Card 1 GB
4. 250 GB hard drive
5. Mouse and keyboard

### III.4 *Software*

The software used in testing this application are:

1. Operating System (OS) Windows Vista 32bit.
2. Operating System (OS) Windows 7 32bit.

### III.5 Implementasi Class

Implementation Class can be seen in Table 4.1

*Table 4.1 Class Implementation table*

| No | Class Name | Physic File Class |
|---|---|---|
| 1 | Mainform | Mainform.vb |
| 2 | Image Watermarking Utilities | ImageWatermarking Utilities.vb |
| 3 | Image Watermarking Threadworker | ImageWatermarking Threadworker.vb |
| 4 | SVD | SVD.vb |
| 5 | Ekstract | Ekstract.vb |
| 6 | Save | Save.vb |
| 7 | Original Image | Original Image.vb |
| 8 | Watemark Image | Watemark Image.vb |
| 9 | Chooose Key | Chooose Key.vb |
| 10 | Save Key | Save Key.vb |

### III.4 Interface Implementation

Implementation of the system is the stage where the system is ready to be operated on an actual stage, so is unknown whether the system has beenmade in accordance with the direncanakan.Pada impl ementation of thissoftware program will be explained how this system works with meme berikandisplay system or application.

Implementation of Application Securi ty Copyrights for digital imagewatermarking method using the technique of SVD (Singular Value decomposition) is comprised of several pages that have the function of self. page will appear sequentially in the order that has been programmed, after a user performs specific process.

### III.6.1 Main Menu Display

Name of Program: Image Watermarking.exe
Form Name: Watermark
Function: Perform input background image f ile, the input watermark image files, Tombo Street, Save Button, Show Informati on. At the beginning of the program will

appear in the image 4.1

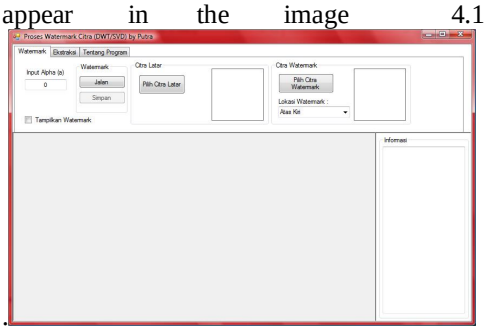


*Figure 4.1 Main Menu Dipslay*

### III.6.2 Extraction Menu Display

Name of Program: Image Watermarking.exe
Form Name: Extraction
Function: Perform input key file, the watermark image file input, Tombo Street, Save Button, Show Information. On the menu tab will appear extraction in figure 4.2.

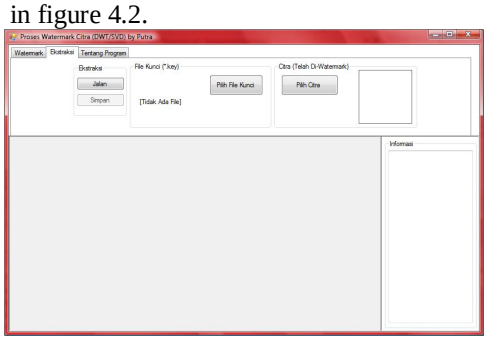


*Figure 4.2Extraction Menu Display*

### III.6.3 First Error Message Display

This error message will Appear when the background image file size is more than image Watermark Small. Figure 4.4 shows the view Error Messages

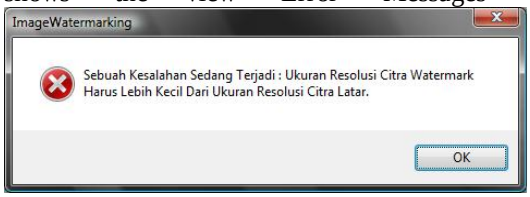



*Figure 4.4 First Display Error Message*

Display Error Messages B
This error message will Appear when the File Input None. Figure 4.5 showsthe view Error Messages




*Figure 4.5 Second Display Error Message*

### III.6.4 Tampilan Menu About

Name of Program: Image Watermarking.exe
Form Name: Extraction
Function: display information programming and manufacturer, Menu AboutThis would S hown if Tab About the Program In Press. Figure 4.6 shows the view Menu About

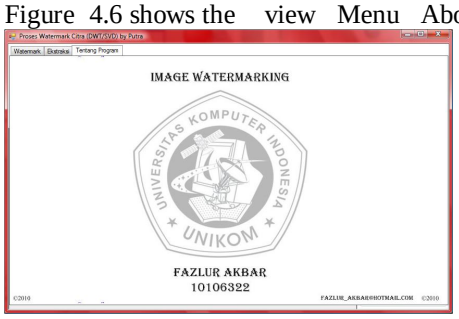



*Figure 4.6 About Menu Display*

## IV. Conclution And Sugestion

### IV.1 Conclution

After doing the design, implementation, analysis and application testing watermarking using SVD method, it can be concluded:

1. This application can Watermarking Against Give files and extract the watermark image from the files that have been given watermarking.

2. Watermarking using SVD method causes the watermark is spread on the whole image, so if the slightest change in the image can be easily identified.

3. Watermark by using the SVD method can not be extracted if conducted attacks that result in changes in the location or the loss (lossie) watermark from the background image, so it can be concluded that the SVD method is not robust watermarking against attacks that cause changes in image geometry such as rotation, resizing, and cropping that cause changes in the location of the watermark information is compared with the file key (key), apart from the above attacks SVD watermark can survive the attack and the addition of noise changes color.

### IV.2 Sugestion

As for suggestions that can be used to develop applications that have been made are as follows:

1. For further development of watermarking methods can be further improved SVD for its value Norm norm because of the higher value the more resistant against standard watermark attacks.
2. For further development of watermarking using DWT method can use other types of wavelets such as Daubechies, Coiflet, Meyer, morlet and mexican hat, these techniques is a technique that is more resistant to attack than the haar wavelet.

## V. Bibliography


[1] http://imagepermanenceinstitute.org/. Image Permanence Institutediakses tanggal 11 April 2010.

[2] http://osulibrary.oregonstate.edu, Oregon State University. *Adaptive-Quantization Digital Image Sensor for Low-Power Image*. Diakses tanggal 11 April 2010.

[3] http://www.tasi.ac.uk, Technical Advisory Service for Images (2005). *The Digital Image*. Diakses tanggal 11 April 2010.

[4] http://www.tasi.ac.uk, Technical Advisory Service for Images (2005). *File Formats and Compression.* Diakses tanggal 11 April 2010.

[5] http://bzupages.com/ Pressman, Roger.S *Software Engineering Third Edition* diakses tanggal 15 November 2010.