A Comparative Study of Blindhide and Filterfirst Algorithm in Digital Images for Steganography Techniques

Purwantoro[1], Garno[2], Munir[3], Ari Suntia [4]
{purwantoro.masbro@staff.unsika.ac.id[1], garno@staff.unsika.ac.id[2], munir@upi.edu[3]}

Universitas Singaperbangsa Karawang, Jl. H.S. Ronggowaluyo Telukjambe Karawang[1,2],
Universitas Pendidikan Indonesia, Jl Dr. Setiabudi Isola Sukasari Bandung[3,4]

Abstract. The study was conducted in the field of hiding messages using the media image. This model is often referred to as steganography technique. Image media used for insertion are BMP (Bitmap Picture) format images, JPEG (Joint Photographic Expert Group) and PNG (Portable Network Graphics). The secret message form that is inserted is in the txt format. The application used for insertion is the Digital Invisible Ink Toolkit. Research parameters include image quality testing, and quantitative testing on each Blindhide algorithm and the Filterfirst algorithm. Image Quality test results using MSE, PSNR, showed significant differences, while the value of SC showed differences but not substantial. The results of testing and analysis evaluations that have been carried out on each image turned out to be an average value of the MSE value of the Blindhide algorithm 0.024 greater than the Filterfirst algorithm 0.023, PSNR Blindhide algorithm 31.91 smaller than the Filterfirst 32.03 algorithm, SC Blindhide algorithm 0.99986 smaller than the Filterfirst algorithm 0.99988. This shows that the insertion of a secret message into the image using the Filterfirst algorithm is safer and will not be suspected.

Keywords: Steganography, Embedding, Blindhide, Filterfirst, Digital Invisible Ink Toolkit

1 Introduction

Cryptography and steganography are techniques that are often used to secure and maintain the confidentiality of data. Cryptography focuses on protecting the contents of information so that it is secure and steganography focuses on transparently protecting data. The media used in steganography to hide messages and hidden media also varies, ranging from text, images (image), audio to video. But in its implementation, image media is one of the most widely used media in steganography, due to its many advantages.

Message storage media in steganography uses cover image media. The image that has been embedded in a message is called stegoimage and is measured for its quality. Stegoimage quality measurement results are the essential thing in knowing how well the steganography algorithm is used. The technique of measuring image quality can use two ways. The first way to measure image quality is done subjectively, namely the measurement of image quality is based on human perception. The second way, using an objective assessment, namely through quantitative measures, to produce standards that are at once the accuracy of the results of steganography. This Word document can be used as a template for papers to be published in

MSCEIS 2019, October 12, Bandung, Indonesia

DOI 10.4108/eai.12-10-2019.2296320

EAI Core Proceedings. Follow the text for further instructions on text formatting, tables, figures, citations, and references.

Steganography as a message security technique must be resistant to attacks that try to find out the embedded message. The attack category is closed type when the original cover image is available before the word is inserted and the image is inserted or stegoimage. Both of these images can be analyzed by looking at the composition of colors, lighting, and pixels. Visual analysis affects the quality of steganographic results. Steganography techniques affect the quality of stegoimage. Many algorithms are used for research in steganography techniques. Each research technique provides its advantages.

Previous studies that carried out experiments with a steganographic algorithm gave various contributions to get the maximum value from a high similarity. So this research is intended to compare the method of blindhide and filterfirst steganography algorithms.

2 Method

The method described in the study includes two things, namely the message insertion technique using blindhide and filterfirst algorithms, test scenarios in filing technique.

2.1 BlindHide

BlindHide is the most straightforward technique for hiding information in an image, the algorithm can be seen in **Figure 1**. The method of hiding starts from the upper left corner of the bit in the picture. The technique works by walking to match the secret message bit characters into the corresponding image bit characters across the bits in the image then down through pixel by pixel. It runs along the significant bit change of the pixel color to match the message to be inserted[1].

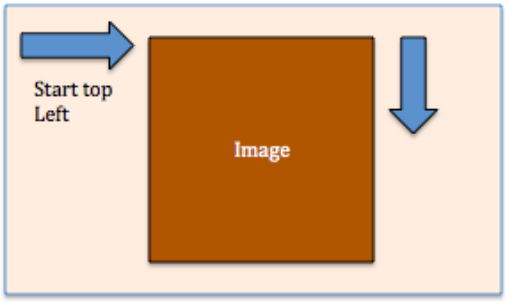


Fig. 1. Blindhide algorithm flow

The message insertion technique with the blindhide algorithm is as follows:
1) Choose a secret message
2) Change the secret message to a decimal value
3) Change the decimal value to an 8-bit binary number
4) Select a 24-bit image (BMP / JPEG / PNG)
5) Read the decimal value of the image matrix
6) Change back to 8-bit binary numbers

7) Image filtering
8) Read the image bit from the top left of the image
9) Insert message bits into the image bits with message bits starting from the left
10) Convert back the insertion value into a new image (stego)

2.2 Filterfirst

FilterFirst uses an edge-detecting filter, such as the Laplace formula, to find the areas of the image where there are pixels that are the least like their neighbours, this is ilustrated in **Figure 2**. It hides in the highest values of the filter first. Since we are only changing the x least significant bits for steganography, we can use the y most significant bits for the filter. Here x and y are integers where 1<=x<=7andy=8-x. We can guarantee that FilterFirst will be able to retrieve the information from the same pixels it hides in because the bits used in filtering are not changed by the hiding process. FilterFirst eliminates the need to provide any extra information, such as the original image, yet ensures the same pixels are used for hiding and retrieval[1,2].

Fig. 2. Filterfirst algorithm flow

The message insertion technique with the filterfirst algorithm is as follows:
1) Choose a secret message
2) Change the secret message to a decimal value
3) Change the decimal value to an 8-bit binary number
4) Select a 24-bit image (BMP / JPEG / PNG)
5) Read the decimal value of the image matrix
6) Change back to 8-bit binary numbers.
7) Image filtering
8) Looking for pixel image values from highest to lowest (from image filters)
9) Insert message bits into selected image bits with message bits starting from the far left
10) Convert back the insertion value into a new image (stego)

2.3 Test Scenario

Test methods performed can be seen in accordance with the following **Figure 3**.

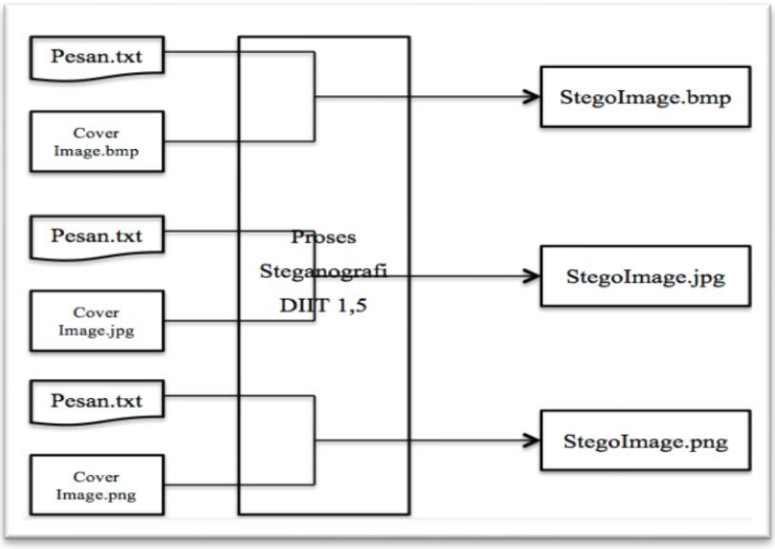


Fig. 3. Test methods.

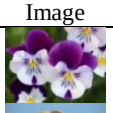
Figure 3 above provides information on the insertion process flow. An image file format used by BMP, JPEG, PNG has inserted a secret message with the Txt format. Message insertion is done using the Digital Invisible Ink Toolkit 1.5 application. The algorithm used is Blindhide and Filter first. Test results compared with the original image. The algorithm that produces the stego image most similar to the original image is the best.

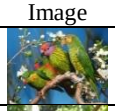
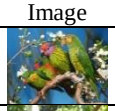
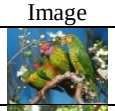
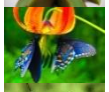
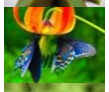
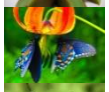
3 Experimental Results

Cover image in this study is the image with *BMP*, *JPEG*, and *PNG* formats. The test sample in this study used message.txt and 30 images in each format. Table 1 below presents a cover image as a population and research sample.

3.1 Cover image

Table 1. Cover image population.

BMP		*JPEG*		*PNG*	
Nama File	Image	Nama File	Image	Nama File	Image
anggrek.bmp 320x240, 225 KB		anggrek.jpg 320x240,38.4KB		anggrek.png 320x240,120KB	
bear.bmp 320x240, 225 KB		bear.jpg 320x240,42.9KB		bear.png 320x240,163KB	
bintang.bmp 320x240, 225 KB		bintang.jpg 320x240,54.9KB		bintang.png 320x240,164KB	

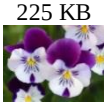
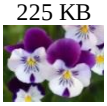
BMP		*JPEG*		*PNG*	
Nama File	Image	Nama File	Image	Nama File	Image
bird.bmp 320x240, 225 KB		bird.jpg 320x240,43.5KB		bird.png 320x240,153KB	
blueberry.bmp 320x240, 225 KB		blueberry.jpg 320x240,34.1KB		blueberry.png 320x240,153KB	
bola.bmp 320x240, 225 KB		bola.jpg 320x240,41.9KB		bola.png 320x240,127KB	
bunga.bmp 320x240, 225 KB		bunga.jpg 320x240,46.5KB		bunga.png 320x240,221KB	
buny.bmp 320x240, 225 KB		buny.jpg 320x240,44.1KB		buny.png 320x240,177KB	
cofe.bmp 320x240, 225 KB		cofe.jpg 320x240,36.9KB		cofe.png 320x240,141KB	
cowberry.bmp 320x240, 225 KB		cowberry.jpg 320x240,42.9KB		cowberry.png 320x240,173KB	
hutan.bmp 320x240, 225 KB		hutan.jpg 320x240,50.8KB		hutan.png 320x240,159KB	
ikan.bmp 320x240, 225 KB		ikan.jpg 320x240,62.3KB		ikan.png 320x240,230KB	
interior.bmp 320x240, 225 KB		interior.jpg 320x240,43.5KB		interior.png 320x240,187KB	
kodok.bmp 320x240, 225 KB		kodok.jpg 320x240,35.5KB		kodok.png 320x240,133KB	
kolam.bmp 320x240, 225 KB		kolam.jpg 320x240,43.0KB		kolam.png 320x240,152KB	
kucing.bmp 320x240, 210 KB		kucing.jpg 320x240,43.8KB		kucing.png 320x240,210KB	
kue.bmp 320x240, 192 KB		kue.jpg 320x240,35.8KB		kue.png 320x240,192KB	
kupukupu.bmp 320x240, 225 KB		kupukupu.jpg 320x240,45.9KB		kupukupu.png 320x240,125KB	
labalaba.bmp 320x240, 225 KB		labalaba.jpg 320x240,39.2KB		labalaba.png 320x240,126KB	
laut.bmp 320x240, 225 KB		laut.jpg 320x240,36.2KB		laut.png 320x240,148KB	
mawar.bmp 320x240, 225 KB		mawar.jpg 320x240,45.6KB		mawar.png 320x240,220KB	

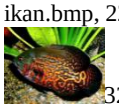
BMP		*JPEG*		*PNG*	
Nama File	Image	Nama File	Image	Nama File	Image
mobil.bmp 320x240, 225 KB		mobil.jpg 320x240,44.8KB		mobil.png 320x240,136KB	
pantai.bmp 320x240, 225 KB		pantai.jpg 320x240,43.9KB		pantai.png 320x240,136KB	
pemandangan.bmp 320x240, 225 KB		pemandangan.jpg 320x240,38.4KB		pemandangan.png 320x240,161KB	
puppy.bmp 320x240, 225 KB		puppy.jpg 320x240,40.1KB		puppy.png 320x240,210KB	
strawberry.bmp 320x240, 225 KB		strawberry.jpg 320x240,61KB		strawberry.png 320x240,164KB	
sungai.bmp 320x240, 225 KB		sungai.jpg 320x240,39.6KB		sungai.png 320x240,176KB	
teddy.bmp 320x240, 225 KB		teddy.jpg 320x240,34.5KB		teddy.png 320x240,93.6KB	
tomat.bmp 320x240, 225 KB		tomat.jpg 320x240,35.9KB		tomat.png 320x240,193KB	
wortel.bmp 320x240, 225 KB		wortel.jpg 320x240,53.6KB		wortel.png 320x240,180KB	

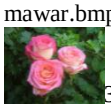
3.2 Inserting message.txt into image.bmp.

Embedding the message.txt to the image will resulting in Table 2.

Table 2. Embedding message to image.bmp.

No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
1	anggrek.bmp 225 KB  320x240	Pesan.txt	225 KB 	225 KB 
2	bear.bmp, 225 KB  320x240	Pesan.txt	225 KB 	225 KB 
3	bintang.bmp, 225 KB  320x240	Pesan.txt	225 KB 	225 KB 
4	bird.bmp, 225 KB  320x240	Pesan.txt	225 KB 	225 KB 
5	blueberry.bmp, 225 KB	Pesan.txt	225 KB	225 KB

No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
	 320x240			
6	bola.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
7	bunga.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
8	buny.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
9	cofe.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
10	cowberry.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
11	hutan.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
12	ikan.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
13	interior.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
14	kodok.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
15	kolam.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
16	kucing.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
17	kue.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
18	kupukupu.bmp, 225 KB	Pesan.txt	225 KB	225 KB

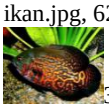
No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
	 320x240			
19	labalaba.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
20	laut.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
21	mawar.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
22	mobil.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
23	pantai.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
24	pemandangan.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
25	puppy.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
26	strawberry.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
27	sungai.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
28	teddy.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
29	tomat.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			
30	wortel.bmp, 225 KB	Pesan.txt	225 KB	225 KB
	 320x240			

3.3 Inserting message.txt into image.jpg

Embedding the message.txt to the image will resulting in Table 3.

Table 3. Embedding Message to Image.jpg.

No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
1	anggrek.jpg. 38.4 KB  320x240	Pesan.txt	 179 KB	 178 KB
2	bear.jpg, 42.9 KB,  320x240	Pesan.txt	 153 KB	 149 KB
3	bintang.jpg, 54.9 KB,  320x240	Pesan.txt	 210 KB	 210 KB
4	bird.jpg, 43.5 KB,  320x240	Pesan.txt	 203 KB	 200 KB
5	blueberry.jpg, 34.1 KB,  320x240	Pesan.txt	 209 KB	 209 KB
6	bola.jpg, 41.9 KB,  320x240	Pesan.txt	 175 KB	 172 KB
7	bunga.jpg, 46.5 KB,  320x240	Pesan.txt	 201 KB	 200 KB
8	buny.jpg, 44.1 KB,  320x240	Pesan.txt	 212 KB	 213 KB
9	cofe.jpg, 36.9 KB,  320x240	Pesan.txt	 174 KB	 173 KB
10	cowberry.jpg, 42.9 KB,  320x240	Pesan.txt	 214 KB	 214 KB
11	hutan.jpg, 50.8 KB,  320x240	Pesan.txt	 186 KB	 186 KB

No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
12	ikan.jpg, 62.3 KB,  320x240	Pesan.txt	 203 KB	 202 KB
13	interior.jpg, 43.5 KB,  320x240	Pesan.txt	 175 KB	 171 KB
14	kodok.jpg, 35.5 KB,  320x240	Pesan.txt	 180 KB	 179 KB
15	kolam.jpg, 43.0 KB,  320x240	Pesan.txt	 196 KB	 195 KB
16	kucing.jpg, 43.8 KB,  320x240	Pesan.txt	 196 KB	 196 KB
17	kue.jpg, 35.8 KB,  320x240	Pesan.txt	 178 KB	 176 KB
18	kupukupu.jpg, 45.9 KB,  320x240	Pesan.txt	 178 KB	 177 KB
19	labalaba.jpg, 39.2 KB,  320x240	Pesan.txt	 186 KB	 184 KB
20	laut.jpg, 36.2 KB,  320x240	Pesan.txt	 193 KB	 190 KB
21	mawar.jpg, 45.6 KB,  320x240	Pesan.txt	 197 KB	 197 KB
22	mobil.jpg, 44.8 KB,  320x240	Pesan.txt	 186 KB	 186 KB
23	pantai.jpg, 43.9 KB,  320x240	Pesan.txt	 178 KB	 174 KB
24	pemandangan.jpg, 38.4 KB,  320x240	Pesan.txt	 198 KB	 198 KB

No	File name	message	*Blindhide Algorithm*	*Filterfirst Algorithm*
25	puppy.jpg, 40.1 KB,  320x240	Pesan.txt	 191 KB	 189 KB
26	strawberry.jpg, 61 KB,  320x240	Pesan.txt	 205 KB	 203 KB
27	sungai.jpg, 39.6 KB,  320x240	Pesan.txt	 164 KB	 159 KB
28	teddy.jpg, 34.5 KB,  320x240	Pesan.txt	 137 KB	 133 KB
29	tomat.jpg, 35.9 KB,  320x240	Pesan.txt	 178 KB	 175 KB
30	wortel.jpg, 53.6 KB ,  320x240	Pesan.txt	 215 KB	 215 KB

3.4 Inserting message.txt into image.png

Embedding the message.txt to the image will resulting in Table 4.

Table 4. Embedding Message to Image.png.

No	File name	message	*Blindhide algorithm*	*Filterfirst algorithm*
1	anggrek.png, 120 KB,  320x240	Pesan.txt	 183 KB	 181 KB
2	bear.png, 163 KB,  320x240	Pesan.txt	 163 KB	 159 KB
3	bintang.png, 164 KB,  320x240	Pesan.txt	 211 KB	 211 KB
4	bird.png, 153 KB,  320x240	Pesan.txt	 196 KB	 193 KB

No	File name	message	*Blindhide algorithm*	*Filterfirst algorithm*
5	blueberry.png, 153 KB,  320x240	Pesan.txt	 209 KB	 209 KB
6	bola.png, 127 KB,  320x240	Pesan.txt	 177 KB	 175 KB
7	bunga.png, 221 KB,  320x240	Pesan.txt	 221 KB	 220 KB
8	buny.png, 177 KB,  320x240	Pesan.txt	 212 KB	 213 KB
9	cofe.png, 141 KB,  320x240	Pesan.txt	 174 KB	 173 KB
10	cowberry.png, 173 KB,  320x240	Pesan.txt	 214 KB	 214 KB
11	hutan.png, 159 KB,  320x240	Pesan.txt	 186 KB	 186 KB
12	ikan.png, 230 KB,  320x240	Pesan.txt	 230 KB	 229 KB
13	interior.png, 187 KB,  320x240	Pesan.txt	 189 KB	 185 KB
14	kodok.png, 133 KB,  320x240	Pesan.txt	 180 KB	 179 KB
15	kolam.png, 152 KB,  320x240	Pesan.txt	 196 KB	 195 KB
16	kucing.png, 152 KB,  320x240	Pesan.txt	 210 KB	 211 KB
17	kue.png, 192 KB,  320x240	Pesan.txt	 193 KB	 191 KB

No	File name	message	*Blindhide algorithm*	*Filterfirst algorithm*
18	kupukupu.png, 125 KB,  320x240	Pesan.txt	 180 KB	 179 KB
19	labalaba.png, 126 KB,  320x240	Pesan.txt	 189 KB	 187 KB
20	laut.png, 148 KB,  320x240	Pesan.txt	 193 KB	 190 KB
21	mawar.png, 220 KB,  320x240	Pesan.txt	 218 KB	 218 KB
22	mobil.png, 136 KB,  320x240	Pesan.txt	 188 KB	 188 KB
23	pantai.png, 136 KB,  320x240	Pesan.txt	 182 KB	 179 KB
24	pemandangan.png, 161 KB,  320x240	Pesan.txt	 198 KB	 198 KB
25	puppy.png. 210 KB,  320x240	Pesan.txt	 210 KB	 208 KB
26	strawberry.png, 164 KB,  320x240	Pesan.txt	 204 KB	 203 KB
27	sungai.png, 176 KB,  320x240	Pesan.txt	 179 KB	 174 KB
28	teddy.png, 93.6 KB,  320x240	Pesan.txt	 141 KB	 138 KB
29	tomat.png, 193 KB,  320x240	Pesan.txt	 194 KB	 191 KB
30	wortel.png, 193 KB,  320x240	Pesan.txt	 215 KB	 215 KB

3.5 MSE image value bmp jpg png

Table 5 below is describing the MSE image value.

Table 5. MSE test results.

No	*filename*	*bmp*			*jpg*			*png*		
		ci	*bh*	*ff*	*ci*	*bh*	*ff*	*ci*	*bh*	*ff*
1	anggrek	0	0.024	0.023	0	0.025	0.024	0	0.024	0.023
2	bear	0	0.026	0.024	0	0.025	0.024	0	0.026	0.024
3	bintang	0	0.025	0.024	0	0.024	0.023	0	0.025	0.024
4	bird	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
5	blueberry	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
6	bola	0	0.025	0.024	0	0.024	0.024	0	0.025	0.024
7	bunga	0	0.024	0.025	0	0.024	0.026	0	0.024	0.025
8	buny	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
9	cofe	0	0.024	0.023	0	0.024	0.023	0	0.024	0.023
10	cowberry	0	0.025	0.024	0	0.024	0.023	0	0.024	0.024
11	hutan	0	0.023	0.022	0	0.024	0.023	0	0.023	0.022
12	ikan	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
13	interior	0	0.025	0.024	0	0.024	0.024	0	0.025	0.024
14	kodok	0	0.021	0.02	0	0.021	0.02	0	0.021	0.02
15	kolam	0	0.024	0.023	0	0.024	0.023	0	0.024	0.023
16	kucing	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
17	kue	0	0.024	0.024	0	0.024	0.024	0	0.024	0.024
18	kupukupu	0	0.026	0.024	0	0.026	0.024	0	0.026	0.024
19	labalaba	0	0.024	0.022	0	0.024	0.022	0	0.024	0.022
20	laut	0	0.024	0.024	0	0.025	0.025	0	0.024	0.024
21	mawar	0	0.024	0.026	0	0.024	0.025	0	0.024	0.026
22	mobil	0	0.025	0.024	0	0.024	0.023	0	0.025	0.024
23	pantai	0	0.024	0.022	0	0.023	0.02	0	0.024	0.022
24	pemandangan	0	0.023	0.023	0	0.023	0.022	0	0.023	0.023
25	puppy	0	0.025	0.023	0	0.025	0.024	0	0.025	0.023
26	strawberry	0	0.033	0.028	0	0.033	0.027	0	0.033	0.028
27	sungai	0	0.025	0.023	0	0.021	0.023	0	0.025	0.023
28	teddy	0	0.024	0.024	0	0.024	0.023	0	0.024	0.024
29	tomat	0	0.024	0.024	0	0.023	0.023	0	0.024	0.024
30	wortel	0	0.025	0.023	0	0.025	0.022	0	0.025	0.023

PSNR value of BMP original images with an average of 99 db. The average PSNR value of the stego image from the Blindhide algorithm is 31,939 db and the Filterfirst algorithm is 32,049 db. PSNR value of Jpg original image with an average of 99 db. The average PSNR value of the stego image from the Blindhide algorithm is 31.88 db and the Filterfirst algorithm is 32.00 db. PSNR value of Png original image with an average of 99 db. The average PSNR value of the stego image from the Blindhide algorithm is 31,906 db and the Filterfirst algorithm is 32,048 db.

3.6 SC image value bmp jpg png

Table 6 below is describing the SC image value.

Table 6. SC test results.

No	*filename*	*bmp*			*jpg*			*png*		
		ci	*bh*	*ff*	*ci*	*bh*	*ff*	*ci*	*bh*	*ff*
1	anggrek	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
2	bear	1	0.9998	0.9999	1	0.9999	0.9999	1	0.9998	0.9999
3	bintang	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
4	bird	1	0.9998	0.9999	1	0.9999	0.9999	1	0.9998	0.9999
5	blueberry	1	0.9998	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
6	bola	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
7	bunga	1	0.9999	0.9999	1	0.9999	0.9998	1	0.9999	0.9999
8	buny	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
9	cofe	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
10	cowberry	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
11	hutan	1	0.9998	0.9998	1	0.9998	0.9998	1	0.9998	0.9998
12	ikan	1	0.9999	0.9999	1	0.9999	0.9998	1	0.9999	0.9999
13	interior	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
14	kodok	1	1	1	1	1	1	1	1	1
15	kolam	1	0.9999	0.9999	1	0.9998	0.9999	1	0.9999	0.9999
16	kucing	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
17	kue	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
18	kupukupu	1	0.9998	0.9998	1	0.9998	0.9998	1	0.9998	0.9998
19	labalaba	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
20	laut	1	0.9998	0.9998	1	0.9998	0.9998	1	0.9999	0.9998
21	mawar	1	0.9999	0.9998	1	0.9999	0.9998	1	0.9999	0.9998
22	mobil	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
23	pantai	1	0.9997	0.9999	1	0.9998	1	1	0.9997	0.9999
24	pemandangan	1	0.9998	0.9998	1	0.9998	0.9998	1	0.9998	0.9998
25	puppy	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
26	strawberry	1	0.9997	0.9998	1	0.9997	0.9998	1	0.9997	0.9998
27	sungai	1	0.9998	0.9999	1	1	0.9999	1	0.9998	0.9999
28	teddy	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
29	tomat	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999
30	wortel	1	0.9999	0.9999	1	0.9999	0.9999	1	0.9999	0.9999

The SC value of original BMP images with an average of 1. The average SC value of the stego image of the Blindhide algorithm is 0.99986 and the Filterfirst algorithm is 0.99988. SC value of Jpeg original image with an average of 1. The average SC value of the stego image of the Blindhide algorithm is 0.9998 and the Filterfirst algorithm is 0.9998. SC value of Png original image with an average of 1. The average SC value of the stego image of the Blindhide algorithm is 0.99987 and the Filterfirst algorithm is 0.99988.

4 Conclution

The results of testing the original image with a stego image showed a slight change in the frequency of each color. The results of testing and analysis evaluations that have been carried out on each image turned out to be an average value of the MSE value of the Blindhide algorithm 0.024 greater than the Filterfirst algorithm 0.023, PSNR Blindhide algorithm 31.91

smaller than the Filterfirst 32.03 algorithm, SC Blindhide algorithm 0.99986 smaller than the Filterfirst algorithm 0.99988. This shows that the insertion of a secret message into the image using the Filterfirst algorithm is safer and will not be suspected.

References

[1] Rana, M.: Parameter Evaluation and Comparison of Algorithms Used In Steganography. International Journal of Engineering Science and Computing . pp. 8137 (2016)

[2] Hempstalk, K.: Hiding Behind Corners: Using Edges in Images for Better Steganography. https://www.researchgate.net/publication/241605558 (2014)

[3] Suryani, H.: Metode Riset Kuantitatif. Penadamedia Group. Jakarta, Indonesia (2015)

[4] Andono, T. M.: Pengolahan Citra Digital. Andi. Yogyakarta, Indonesia (2017)

[5] Zam, E.: Melacak, Membajak & Membobol Data Rahasia. Mediakita. South Jakarta, Indonesia (2013)

[6] Sahyar, M. M.: Algoritma dan Pemprograman Menggunakan Matlab (Matrix Laboratory). Kencana. Jakarta, Indonesia (2016)

[7] Indriyono, B. V.: Implementasi Sistem Keamanan File dengan Metode Steganografi EOF dan Enkripsi Caesar Cipher. jurnal SISFO. pp. 4-5 (2016)

[8] Hidayatullah, P.: Pengolahan Citra Digital – Teori dan Aplikasi Nyata. Informatika. Bandung, Indonesia (2017)

[9] Bahrudiin, A. S.: Metode Penelitian Kuantitatif Aplikasi dalam Pendidikan. Deepublish. Yogyakarta (2014)

[10] Munir, R.: Kriptografi. Informatika. Bandung, Indonesia (2006)

[11] Reque, J. J., Mingeut, J. M.: SLSB : Improving the Steganographic Algorithm LSB. International Journal of Engineering Science and Computing. pp. 8137 (2009)

[13] M. Mu, L. B.: Multimedia Data Hiding. Springer-Verlag. New York, USA (2003)

[14] Fridrich J, G. M.: Practical Steganalysis of Digital Images-State of the Art. Dartmount (2006)

[15] Juan Jose, J. M.: SLSB : Improving the Steganographic Algorithm LSB (2009)

[16] Sugiyono, P. D.: Metode Penelitian Kuantitaf, Kuantitatif, dan R&D. Alfabeta Bandung, Indonesia (2012)