

LAMPIRAN – A

CITRA HASIL PERCOBAAN

1. Citra Hasil Watermarking

Nama Citra	Citra Asli $\alpha = 0.01$	Citra yang Telah Disisipkan Watermark	Watermark Asli dan Watermark Hasil Ekstraksi
Lena 256			   
Baboon 256			   
Barbara 256			   

Lena 512			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Baboon 512			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 512			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

Nama Citra	Citra Asli $\alpha = 0.1$	Citra yang Telah Disisipkan <i>Watermark</i>	<i>Watermark</i> Asli dan <i>Watermark</i> Hasil Ekstraksi
Lena 256			   
Baboon 256			   
Barbara 256			   

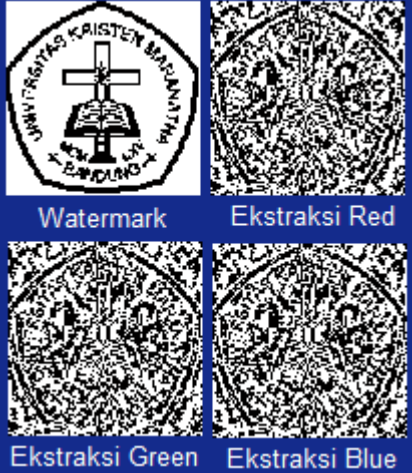
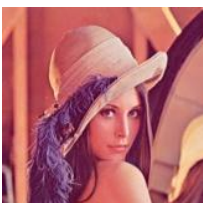
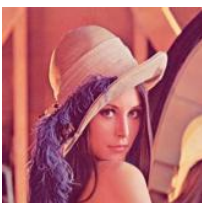
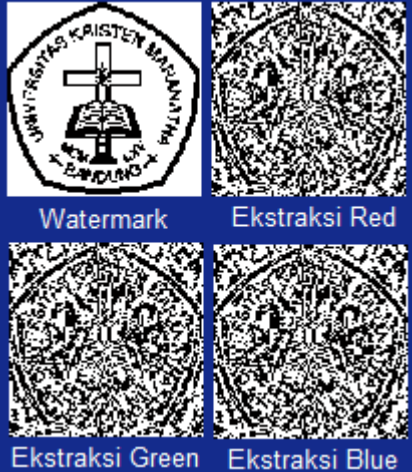
Lena 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

Nama Citra	Citra Asli $\alpha = 0.3$	Citra yang Telah Disisipkan <i>Watermark</i>	<i>Watermark</i> Asli dan <i>Watermark</i> Hasil Ekstraksi
Lena 256			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Baboon 256			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 256			  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

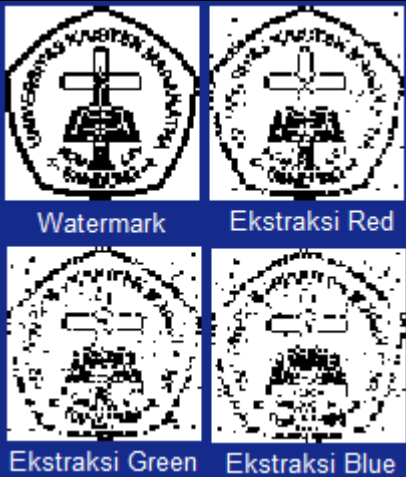
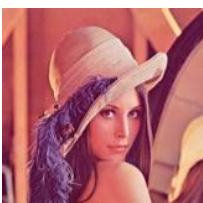
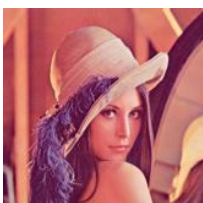
Lena 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512			 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

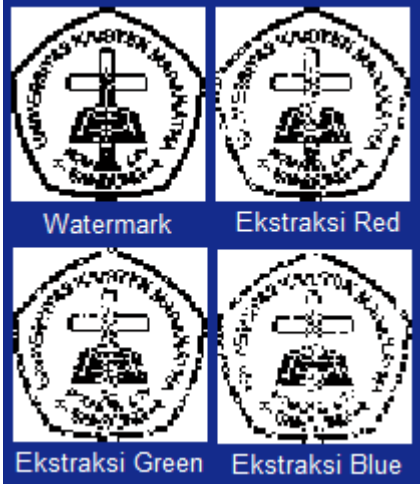
2. Hasil ekstraksi *watermark* citra Lena yang telah disisipkan *watermark* dan di kompres dengan faktor kualitas (Q)=0, 5,10.

Nama Citra	Citra terwatermark	Citra terwatermark di kompres Q=0	Watermark Asli dan Watermark Hasil Ekstraksi
Lena 256	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Lena 512	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Lena 256	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

Lena 512	 $\alpha = 0.1$		
Lena 256	 $\alpha = 0.3$		
Lena 512	 $\alpha = 0.3$		

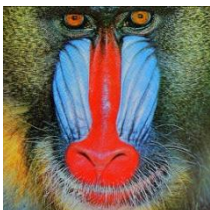
Nama Citra	Citra terwatermark	Citra terwatermark di kompres Q=5	Watermark Asli dan Watermark Hasil Ekstraksi
Lena 256	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Lena 512	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Lena 256	 $\alpha = 0.1$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

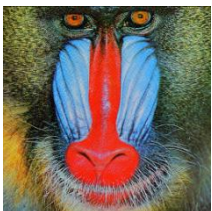
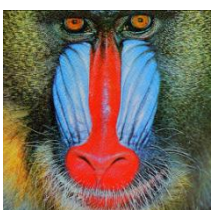
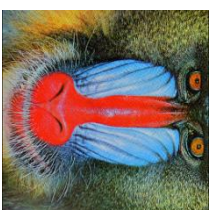
Lena 512	 $\alpha = 0.1$		
Lena 256	 $\alpha = 0.3$		
Lena 512	 $\alpha = 0.3$		

Nama Citra	Citra terwatermark	Citra terwatermark di kompres Q=10	Watermark Asli dan Watermark Hasil Ekstraksi
Lena 256	 $\alpha = 0.01$		
Lena 512	 $\alpha = 0.01$		
Lena 256	 $\alpha = 0.1$		

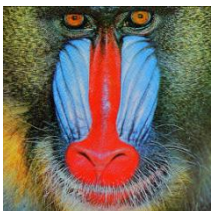
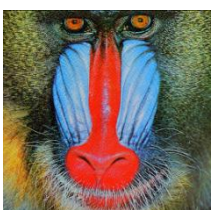
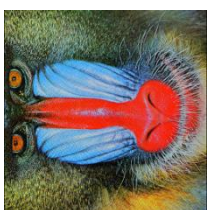
Lena 512	 $\alpha = 0.1$		
Lena 256	 $\alpha = 0.3$		
Lena 512	 $\alpha = 0.3$		

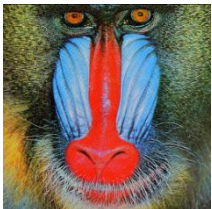
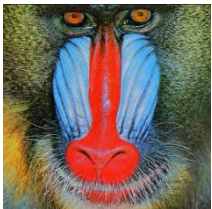
3. Hasil ekstraksi *watermark* citra Baboon yang telah disisipkan *watermark* dan di rotasi dengan rotasi kanan 90°, kiri 90°, dan 180°.

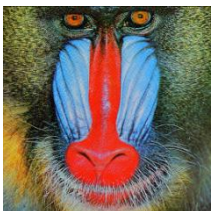
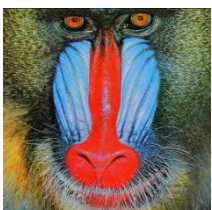
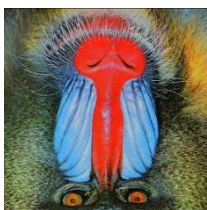
Nama Citra	Citra terwatermark	Citra terwatermark di rotasi kanan 90°	Watermark Asli dan Watermark Hasil Ekstraksi
Baboon 256	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 512	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 256	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

Baboon 512	 $\alpha = 0.1$		
Baboon 256	 $\alpha = 0.3$		
Baboon 512	 $\alpha = 0.3$		

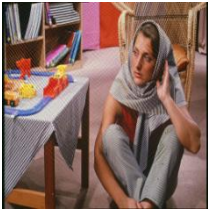
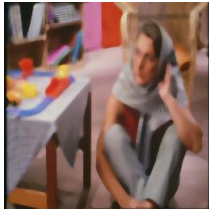
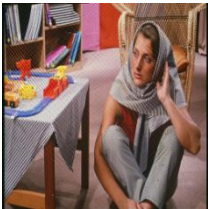
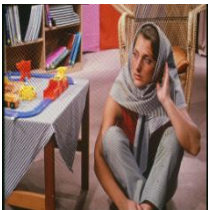
Nama Citra	Citra terwatermark	Citra terwatermark di rotasi kiri 90°	Watermark Asli dan Watermark Hasil Ekstraksi
Baboon 256	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 512	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Baboon 256	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

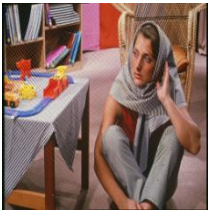
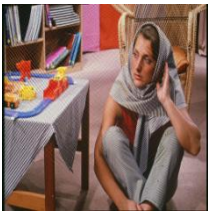
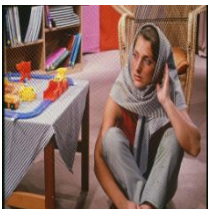
Baboon 512	 $\alpha = 0.1$		 Watermark Ekstraksi Red Ekstraksi Green Ekstraksi Blue
Baboon 256	 $\alpha = 0.3$		 Watermark Ekstraksi Red Ekstraksi Green Ekstraksi Blue
Baboon 512	 $\alpha = 0.3$		 Watermark Ekstraksi Red Ekstraksi Green Ekstraksi Blue

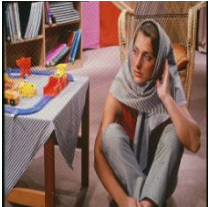
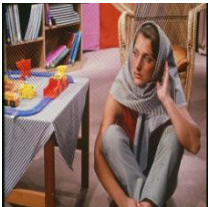
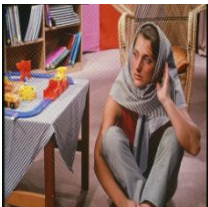
Nama Citra	Citra terwatermark	Citra terwatermark di rotasi 180°	Watermark Asli dan Watermark Hasil Ekstraksi
Baboon 256	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Baboon 512	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Baboon 256	 $\alpha = 0.1$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

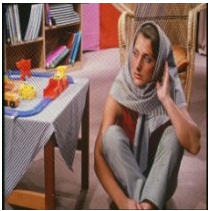
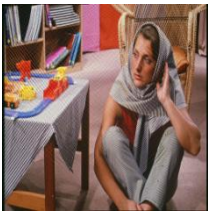
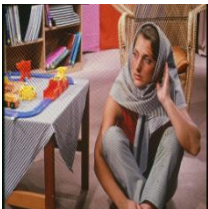
Baboon 512	 $\alpha = 0.1$		
Baboon 256	 $\alpha = 0.3$		
Baboon 512	 $\alpha = 0.3$		

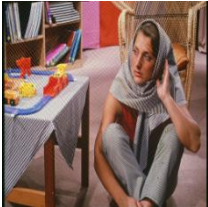
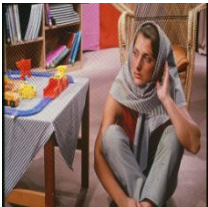
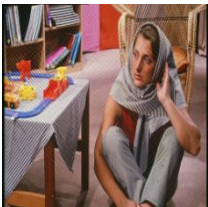
4. Hasil ekstraksi *watermark* citra Barbara yang telah disisipkan *watermark* dan di *median filtering* 3x3, 5x5, dan 7x7 piksel.

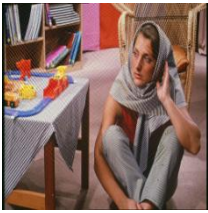
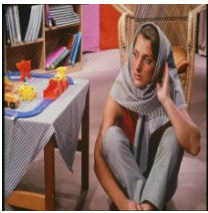
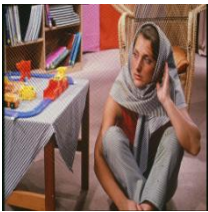
Nama Citra	Citra terwatermark	Citra terwatermark di <i>median filter</i> 3x3	Watermark Asli dan Watermark Hasil Ekstraksi
Barbara 256	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512	 $\alpha = 0.01$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 256	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

Barbara 512	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 256	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

Nama Citra	Citra terwatermark	Citra terwatermark di <i>median filter 5x5</i>	Watermark Asli dan Watermark Hasil Ekstraksi
Barbara 256	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 512	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 256	 $\alpha = 0.1$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

Barbara 512	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 256	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

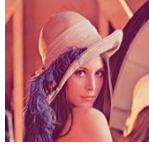
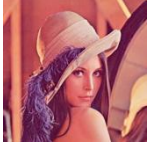
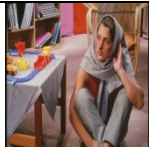
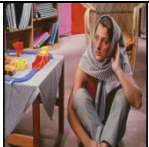
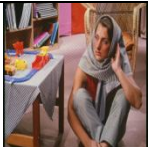
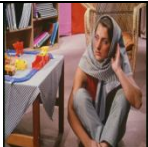
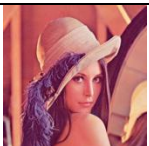
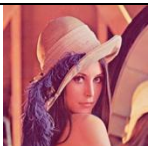
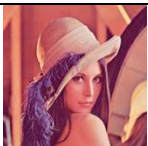
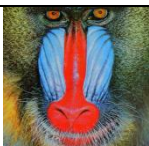
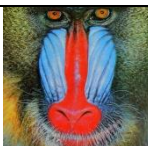
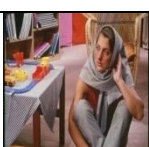
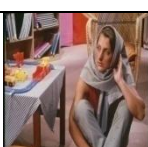
Nama Citra	Citra terwatermark	Citra terwatermark di <i>median filter 7x7</i>	Watermark Asli dan Watermark Hasil Ekstraksi
Barbara 256	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 512	 $\alpha = 0.01$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue
Barbara 256	 $\alpha = 0.1$		  Watermark Ekstraksi Red   Ekstraksi Green Ekstraksi Blue

Barbara 512	 $\alpha = 0.1$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 256	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue
Barbara 512	 $\alpha = 0.3$		 Watermark  Ekstraksi Red  Ekstraksi Green  Ekstraksi Blue

LAMPIRAN – B

DATA MOS

Mean Opinion Score (MOS) kualitas citra setelah disisipkan watermark

Nama Citra	Citra Asli	Citra yang Telah Disisipkan Watermark dengan $\alpha=0.01$	Citra yang Telah Disisipkan Watermark dengan $\alpha=0.1$	Citra yang Telah Disisipkan Watermark dengan $\alpha=0.3$
Lena 256				
Baboon 256				
Barbara 256				
Lena 512				
Baboon 512				
Barbara 512				

Kriteria penilaian kualitatif yang digunakan adalah :

1. *Excellent* yang direpresentasikan dengan angka 5, citra terwatermark mempunyai kualitas yang sangat baik yaitu sama persis dengan citra asli (*host image*).
2. *Good* yang direpresentasikan dengan angka 4, citra terwatermark mempunyai kualitas baik yaitu sama dengan citra asli (*host image*).
3. *Fair* yang direpresentasikan dengan angka 3, citra terwatermark mempunyai kualitas cukup baik yaitu agak berbeda dengan citra asli (*host image*).
4. *Poor* yang direpresentasikan dengan angka 2, citra terwatermark mempunyai kualitas buruk yaitu berbeda dengan citra asli (*host image*).
5. *Unsatisfactory* yang direpresentasikan dengan angka 1, citra terwatermark mempunyai kualitas sangat buruk yaitu sangat berbeda dengan citra asli (*host image*).

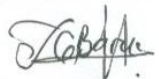
Nama : BOBY WISELY -2 (0622031)		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	3	4	4
Baboon 256	4	4	4
Baboon 512	3	3	3
Barbara 256	4	3	3
Barbara 512	4	3	3

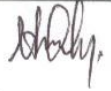
Nama : Yosefin (0822091)		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	3	4	4
Baboon 256	4	4	3
Baboon 512	4	3	4
Barbara 256	4	3	4
Barbara 512	4	3	3

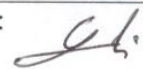
Nama : Richard (0922001)		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	3	3	4
Baboon 256	4	4	4
Baboon 512	3	4	4
Barbara 256	3	3	3
Barbara 512	3	3	3

Nama : Anisa Fardhani P		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	4	4
Lena 512	4	4	4
Baboon 256	4	4	4
Baboon 512	4	4	4
Barbara 256	4	3	4
Barbara 512	4	4	4

Nama : HERIDAN		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	3	4
Lena 512	4	4	4
Baboon 256	4	4	4
Baboon 512	4	4	4
Barbara 256	3	4	4
Barbara 512	4	4	4

Nama : Ikuthen Gabriel Barus		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	4	4
Lena 512	3	4	4
Baboon 256	4	4	4
Baboon 512	4	4	4
Barbara 256	3	4	4
Barbara 512	4	4	4

Nama : NIK CHAYO PRITO 0622082		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	4	3
Lena 512	4	3	3
Baboon 256	4	3	4
Baboon 512	3	3	4
Barbara 256	3	4	4
Barbara 512	4	4	4

Nama : Grandi Permedi 0622075		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	4	3	4
Baboon 256	3	4	3
Baboon 512	3	4	3
Barbara 256	4	3	3
Barbara 512	3	4	4

Nama : Jeffry 0622023		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	3	4	3
Baboon 256	4	3	4
Baboon 512	3	3	5
Barbara 256	4	4	3
Barbara 512	3	3	4

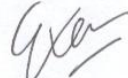
Nama : Daniel Octa Vianus		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	3	4	3
Baboon 256	4	4	4
Baboon 512	4	3	4
Barbara 256	4	4	4
Barbara 512	4	4	4

Nama : Yonathan Alfa. H (0822065)		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	3	4
Lena 512	4	4	3
Baboon 256	3	3	4
Baboon 512	3	4	4
Barbara 256	4	4	4
Barbara 512	3	3	4

Nama : Ramedi		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	4	3
Lena 512	4	3	3
Baboon 256	3	3	4
Baboon 512	3	3	4
Barbara 256	3	4	3
Barbara 512	3	3	3

Nama : Andreas		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	2	3	4
Lena 512	3	4	3
Baboon 256	3	3	3
Baboon 512	3	3	3
Barbara 256	3	2	2
Barbara 512	3	3	2

Nama : Yupi		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	3	4	3
Lena 512	3	4	3
Baboon 256	2	3	4
Baboon 512	3	3	3
Barbara 256	3	3	3
Barbara 512	3	3	4

Nama : EXA		Tanda tangan : 	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	4	4
Lena 512	5	3	4
Baboon 256	4	3	3
Baboon 512	5	4	4
Barbara 256	3	3	3
Barbara 512	5	5	4

Nama : <i>Theta</i>		Tanda tangan : <i>Theta</i>	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	5	4
Lena 512	5	5	5
Baboon 256	5	4	4
Baboon 512	4	4	5
Barbara 256	5	5	5
Barbara 512	5	4	5

Nama : <i>NINDA</i>		Tanda tangan : <i>NINDA</i>	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	5	5	5
Lena 512	4	5	4
Baboon 256	4	3	3
Baboon 512	5	4	5
Barbara 256	4	4	4
Barbara 512	3	5	5

Nama : <i>Ihea</i>		Tanda tangan : <i>Ihea</i>	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	5	4
Lena 512	4	3	3
Baboon 256	5	4	4
Baboon 512	5	4	5
Barbara 256	5	5	5
Barbara 512	4	5	5

Nama : Hiqam		Tanda tangan : Haez	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	5	4	5
Lena 512	4	5	4
Baboon 256	3	3	4
Baboon 512	5	4	3
Barbara 256	5	5	5
Barbara 512	5	5	4

Nama : Nadzar		Tanda tangan : Meiz	
Citra	$\alpha=0.01$	$\alpha=0.1$	$\alpha=0.3$
Lena 256	4	5	3
Lena 512	5	3	5
Baboon 256	3	5	5
Baboon 512	4	5	4
Barbara 256	5	5	3
Barbara 512	5	4	5

LAMPIRAN – C
***LISTING* PROGRAM**

Program Utama Proses Watermarking

```
function M_star = penyisipan_per_channel(M, W, alfa)

Mc = dct2(M);
[jml_bar jml_kol] = size(Mc);
N = jml_bar;
awal = round(N/4)+1;
akhir = round(3/4*N);
Mmid = Mc(awal:akhir, awal:akhir);

[LL,LH,HL,HH] = dwt2(Mmid, 'haar');
Mw{1} = LL;
Mw{2} = LH;
Mw{3} = HL;
Mw{4} = HH;

Mw_LL = Mw{1};
[U,S,V] = svd(Mw_LL);

W = double(W);
Wc = dct2(W);

[Uw,Sw,Vw] = svd(Wc);

S_star = S + (alfa*Sw);

Mw_star = U * S_star * V';

Mmid_star = idwt2(Mw_star, Mw{2}, Mw{3}, Mw{4}, 'haar');
Mc_star = Mc;
Mc_star(awal:akhir, awal:akhir) = Mmid_star;

M_star = idct2(Mc_star);

function W_aksen_bw = ekstraksi_per_channel(M_star, W, alfa,
Sglob)

Mc_star = dct2(M_star);
[jml_bar jml_kol] = size(Mc_star);
N = jml_bar;
awal = round(N/4)+1;
akhir = round(3/4*N);
Mmid_star = Mc_star(awal:akhir, awal:akhir);

[LL,LH,HL,HH] = dwt2(Mmid_star, 'haar');
Mw_star{1} = LL;
Mw_star{2} = LH;
Mw_star{3} = HL;
Mw_star{4} = HH;

[U,S_star,V] = svd(Mw_star{1});

Wc = dct2(W);
```

```

[Uw,Sw,Vw] = svd(Wc);

Sw_aksen = (S_star-Sglob)/alfa;

Wc_aksen = Uw * Sw_aksen * Vw';

W_aksen = idct2(Wc_aksen);
level = graythresh(W_aksen);
W_aksen_bw = im2bw(W_aksen,level);

```