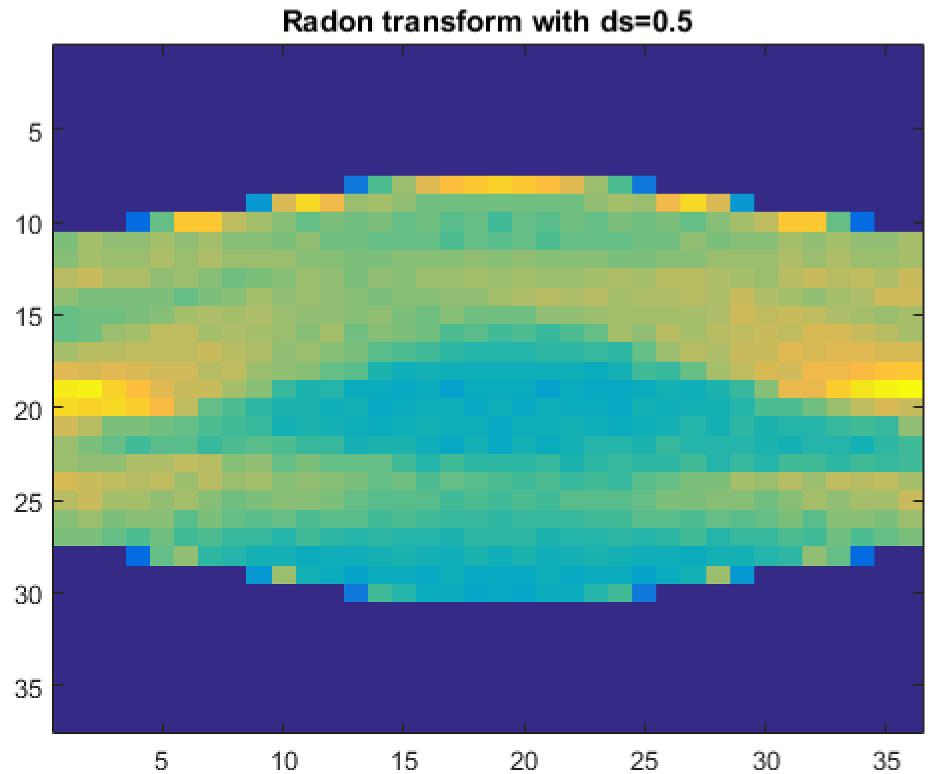
Table of Contents

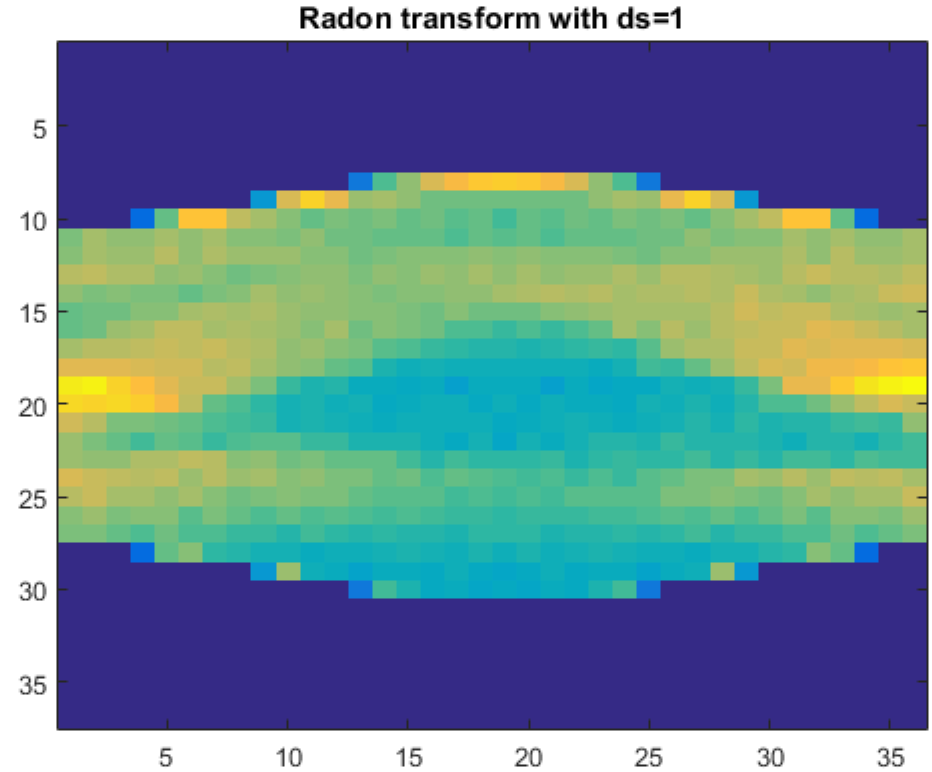
PARTS 1 & 2

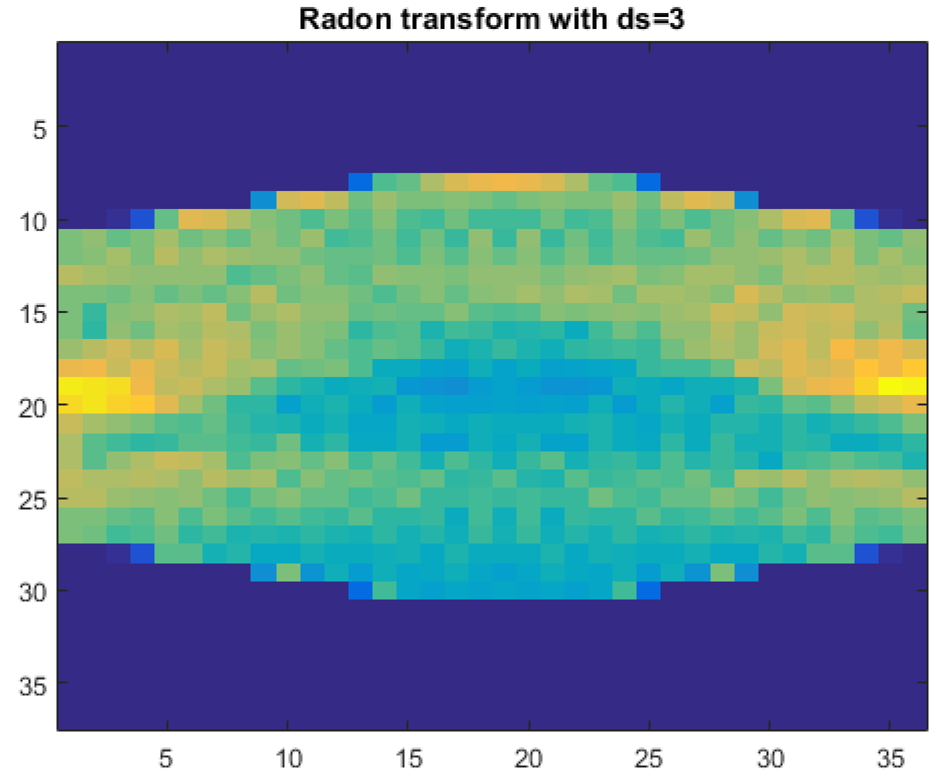
```
image=phantom(128);

ds=0.5;
dt=5;
tic;
R0=myRadonTrans(image,dt,ds);
figure; imagesc(R0); title('Radon transform with ds=0.5');
toc;

ds=1;
tic;
R1=myRadonTrans(image,dt,ds);
figure; imagesc(R1); title('Radon transform with ds=1');
toc;

ds=3;
tic;
R2=myRadonTrans(image,dt,ds);
figure; imagesc(R2); title('Radon transform with ds=3');
toc;

disp('Thus we can see that when ds increases,the computational time
 decreases.');
disp('But when ds increases, blurring also increases');
disp('Hence we can choose ds=1 as an optimum ds meeting the trade off
 between time and blurring');

disp('The interpolation scheme chosen in bilinear interpolation,');
disp('which is the default scheme of interp2 function');
disp('This scheme is chosen because it is well suited for discrete 2D
 images');
```

```
Elapsed time is 2.326155 seconds.
Elapsed time is 1.573062 seconds.
Elapsed time is 1.105517 seconds.
Thus we can see that when ds increases,the computational time
 decreases.
But when ds increases, blurring also increases
Hence we can choose ds=1 as an optimum ds meeting the trade off
 between time and blurring
The interpolation scheme chosen in bilinear interpolation,
```

```
which is the default scheme of interp2 function
This scheme is chosen because it is well suited for discrete 2D images
```




Radon transform with ds=1
5
10
15
20
25
30
35
5
10
15
20
25
30
35


Radon transform with ds=3
5
10
15
20
25
30
35
5
10
15
20
25
30
35

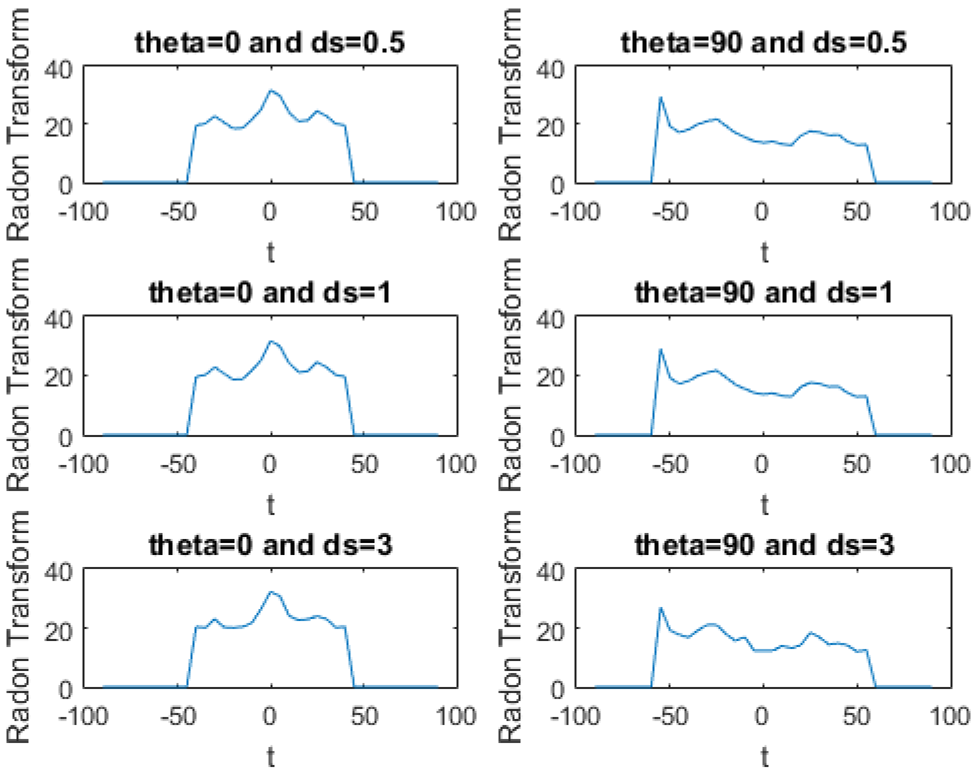
PART 3

```
ds=0.5;
theta=0;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
end
figure; subplot(3,2,1);plot(t,R);
title('theta=0 and ds=0.5');
xlabel('t');
ylabel('Radon Transform');

ds=0.5;
theta=90;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
end
subplot(3,2,2);plot(t,R);
title('theta=90 and ds=0.5');
xlabel('t');
ylabel('Radon Transform');

ds=1;
theta=0;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
end
subplot(3,2,3);plot(t,R);
title('theta=0 and ds=1');
xlabel('t');
ylabel('Radon Transform');


ds=1;
theta=90;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
```

```
end
subplot(3,2,4);plot(t,R);
title('theta=90 and ds=1');
xlabel('t');
ylabel('Radon Transform');


ds=3;
theta=0;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
end
subplot(3,2,5);plot(t,R);
title('theta=0 and ds=3');
xlabel('t');
ylabel('Radon Transform');

ds=3;
theta=90;
t=-90:dt:90;
len=length(t);
R=zeros(1,len);

for i=1:len
    R(i)=myIntegration(image,t(i),theta,ds);
end

subplot(3,2,6);plot(t,R);
title('theta=90 and ds=3');
xlabel('t');
ylabel('Radon Transform');

disp('The plots with theta=0 are less smoother than theta=90');
disp('The plots with higher ds are less smoother than those with lower
 ds.');
disp('This is due to the fact that the phantom image has short dark
 patches in X direction,which is theta=0,');
disp('but has long dark patches in the Y direction, which is
 theta=90');
disp('As ds increases,we save computation time, but we undersample the
 points');
disp('Hence the plots with higher ds are less smoother');
```

The plots with theta=0 are less smoother than theta=90
The plots with higher ds are less smoother than those with lower ds.
This is due to the fact that the phantom image has short dark patches in X direction,which is theta=0,
but has long dark patches in the Y direction, which is theta=90
As ds increases,we save computation time, but we undersample the points

Hence the plots with higher ds are less smoother

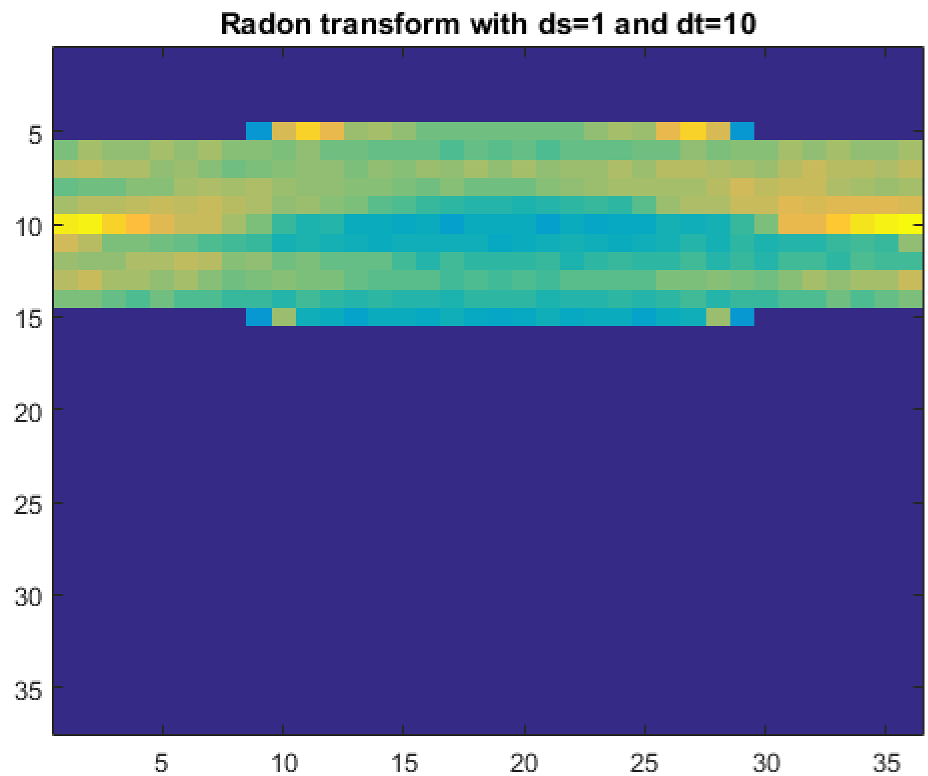


PART 4

```
ds=1;
dt=10;
tic;
R1=myRadonTrans(image,dt,ds);
figure; imagesc(R1); title('Radon transform with ds=1 and dt=10');
toc;
disp('Thus larger dT causes blurring in the radon transform');

disp('The two parameters ?t and ?? ?will define the x-y resolution of
 the transform,');
disp('which essentially is another way to sample Fourier transform.');
disp('At higher resolution, the exposure time to the radiation is
 longer for the patients');
disp('which is not recommended. At lower resolution,');
disp('increasing these parameters might introduce artifacts like
 aliasing in the reconstructed image.');
disp('Thus, according to the requirement of the resolution of the
 reconstructed image,');
disp('we can use and tune the parameters ?t and ??');
```

Elapsed time is 0.841512 seconds.
Thus larger dT causes blurring in the radon transform

The two parameters ?t and ?? ?will define the x-y resolution of the transform,
which essentially is another way to sample Fourier transform.
At higher resolution, the exposure time to the radiation is longer for the patients
which is not recommended. At lower resolution,
increasing these parameters might introduce artifacts like aliasing in the reconstructed image.
Thus, according to the requirement of the resolution of the reconstructed image,
we can use and tune the parameters ?t and ??



PART 5

```
disp('The parameter ?s relates to the quantisation noise.');
disp('Higher ?s results in coarser quantisation of the reconstructed
 image');
disp('and we can’t improve the noise beyond a certain limit even after
 lowering ?s');
disp('since the number of pixels in the grid is finite.');
disp('Also, ?s <<1 would lead to higher overhead for interpolation');
disp('and hence computationally infeasible and ?s >>1 would lead to
 loss in resolution of the reconstructed image.');
disp('Thus, there exists an optimum level for delta given the number
 of pixels in the grid and vice versa.');
```

The parameter ?s relates to the quantisation noise.
Higher ?s results in coarser quantisation of the reconstructed image
and we can’t improve the noise beyond a certain limit even after lowering ?s
since the number of pixels in the grid is finite.
Also, ?s <<1 would lead to higher overhead for interpolation
and hence computationally infeasible and ?s >>1 would lead to loss in resolution of the reconstructed image.
Thus, there exists an optimum level for delta given the number of pixels in the grid and vice versa.

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