t = [6e-06;-1.7e-05; 4e-06;-4e-06;0; 1.9e-05; -5e-06;5e-06];

s2=sqrt(2);

G = [1,0,0,1,0,0,1,0,0;

0,1,0,0,1,0,0,1,0;

0,0,1,0,0,1,0,0,1;

1,1,1,0,0,0,0,0,0;

0,0,0,1,1,1,0,0,0;

0,0,0,0,0,0,1,1,1;

s2,0,0,0,s2,0,0,0,s2;

0,0,0,0,0,0,0,0,s2];

% Find dimensions of G

[m,n]=size(G);

Gdagger = pinv(G);

% Get the singular values for the system matrix

[U,S,V] = svd(G);

p=rank(G);

diag(S);

Vp = V(:,1:p);

Up =U(:,1:p);

Sp = S(1:p,1:p);

mdagger = Vp\* inv(Sp)\*Up.'\*t;

1.

%Gdagger\*G;

%traceR1 = sum(diag(Gdagger\*G));

Rm = Vp\*Vp'

traceRm = trace(Rm)

2.

%G\*Gdagger;

%traceR = sum(diag(G\*Gdagger));

Rd = Up\*Up'

% Find and display data resolution matrix

figure(3)

clf

colormap('gray')

imagesc(Rd)

caxis([-0.2 1.0])

set(colorbar,'Fontsize',18);

set(gca,'xtick',[1,2,3,4,5,6,7,8,9]);

set(gca,'ytick',[1,2,3,4,5,6,7,8,9]);

xlabel('j')

ylabel('i')

title('Data Resolution Matrix')

traceRd = trace(Rd)

3.

I = eye(9);

Rm - I

Vo = V(:,p+1:n);

-Vo\*Vo'

norm(-Vo\*Vo',2)

traceRm - n

4.

% Spike resolution test

% Construct spike model

mtest=zeros(n,1);

mtest(5)=1;

% Get noise free data for the spike model (forward problem)

dtest=G\*mtest;

% Display spike model and noise free data

disp('model spike and predicted data')

mtest

dtest

% Display recovered model from spike test

disp('recovered model from the spike test')

% Let Matlab compute the psuedoinverse for us with pinv

mdagger=pinv(G)\*dtest

% Display reshaped noise free spike model with color bar

figure(5)

clf

colormap('gray')

imagesc(reshape(mtest,3,3))';

caxis([-0.1 1.0])

set(colorbar,'Fontsize',18);

set(gca,'xtick',[1,2,3]);

set(gca,'ytick',[1,2,3]);

xlabel('j')

ylabel('i')

title('Spike Test Model')

disp('Displaying spike test model (fig. 5)')

print -deps2 c3fspike.eps

% Display reshaped recovered spike model with colorbar

figure(6)

clf

colormap('gray')

imagesc(reshape(mdagger,3,3)');

caxis([-0.1 1.0])

set(colorbar,'Fontsize',18);

set(gca,'xtick',[1,2,3]);

set(gca,'ytick',[1,2,3]);

xlabel('j')

ylabel('i')

title('Recovered Model from Spike Test Model Data')

5.

a = cond(Gdagger)

b=cond(G)

%Sp(1,1)