**Handwriting image reconstruction**

The database “mnist\_all.mat” contains 10 character training sets and 10 test sets. In this example, we choose five training sets each contains 10 different handwriting sets.

load('mnist\_all.mat')

imgs = [train0(1:10, :);

train1(1:10, :);

train2(1:10, :);

train3(1:10, :);

train4(1:10, :)];

imgs = im2double(imgs);

%Show all 50 training characters

for i = 1:50

subplot(5, 10, i);

imshow(reshape(imgs(i, :), 28, 28));

end %show the training data set



**PCA procedure and show the Eigenfaces**

[coeff,score,latent] = princomp(double(imgs),'econ');

% show the Eigenfaces

figure;

for i=1:49

subplot(7, 7, i);

imshow(reshape(coeff(:, i), 28, 28));

end



figure; %To be clearer, show the complement of Eigenface

for i=1:49

subplot(7, 7, i);

imshow(1.0 - reshape(coeff(:, i), 28, 28));

end

base\_img = mean(imgs); %the **average face** of the image

figure; imshow(reshape(base\_img, 28, 28));



%Reconstruct the first character using the first n Eigenfaces

img1 = base\_img';

n=2;

for i = 1:n

img1 = img1 + coeff(:, i).\*score(1, i);

end

figure; imshow(reshape(img1, 28, 28)); %show the reconstructed character



%Reconstruct the first character using first 30 Eigenfaces

img2 = base\_img';

for i = 1:30

img2 = img2 + coeff(:, i).\*score(1, i);

end

figure; imshow(reshape(img2, 28, 28));

