

## Contents

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```
clc; clear all; close all
```

## Load test 1 data

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```
load('cam1_1.mat')  
% imshow(vidFrames1_1)  
load('cam2_1.mat')  
% imshow(vidFrames2_1)  
load('cam3_1.mat')  
% imshow(vidFrames3_1)
```

## Obtain the x and y variable data points

---

```
numFrames11 = size(vidFrames1_1, 4);  
numFrames21 = size(vidFrames2_1, 4);  
numFrames31 = size(vidFrames3_1, 4);  
  
x11 = zeros(numFrames11, 1);  
y11 = x11;  
bottom = 430;  
top = 190;  
left = 300;  
right = 390;  
for i = 1 : numFrames11  
    X11 = double(rgb2gray(vidFrames1_1(:, :, :, i)));  
    X11(:, 1:left) = 0;  
    X11(:, right:end) = 0;  
    X11(1:top, :) = 0;  
    X11(bottom:end, :) = 0;  
    [M, I] = max(max(X11));  
    [row, col] = find(X11 >= 0.9*M);  
    x11(i) = mean(col);  
    y11(i) = mean(row);  
end  
x11 = x11 - mean(x11);  
y11 = y11 - mean(y11);  
[M, I] = max(y11(1:50));  
x11 = x11(I:end);  
y11 = y11(I:end);  
  
figure(1)  
set(gca, 'FontSize', 15)  
sgtitle('Test 1');  
subplot(1, 3, 1)
```

```

plot(x11);
hold on;
plot(y11);
legend('X1', 'Y1');
title('Camera 1');
xlabel('Frames');
ylabel('Pixel position');

x21 = zeros(numFrames21, 1);
y21 = x21;
bottom = 370;
top = 100;
left = 250;
right = 340;
for i = 1 : numFrames21
    X21 = double(rgb2gray(vidFrames2_1(:, :, :, i)));
    X21(:, 1:left) = 0;
    X21(:, right:end) = 0;
    X21(1:top, :) = 0;
    X21(bottom:end, :) = 0;
    [M, I] = max(max(X21));
    [row, col] = find(X21 >= 0.95*M);
    x21(i) = mean(col);
    y21(i) = mean(row);
end
x21 = x21 - mean(x21);
y21 = y21 - mean(y21);
[M, I] = max(y21(1:50));
x21 = x21(I:end);
y21 = y21(I:end);

subplot(1, 3, 2)
plot(x21);
hold on;
plot(y21);
legend('X2', 'Y2');
title('Camera 2');
xlabel('Frames');
ylabel('Pixel position');

x31 = zeros(numFrames31, 1);
y31 = x31;
bottom = 460;
top = 240;
left = 280;
right = 490;
for i = 1 : numFrames31
    X31 = double(rgb2gray(vidFrames3_1(:, :, :, i)));
    X31(:, 1:left) = 0;
    X31(:, right:end) = 0;
    X31(1:top, :) = 0;
    X31(bottom:end, :) = 0;
    [M, I] = max(max(X31));
    [row, col] = find(X31 >= 0.9*M);
    y31(i) = mean(col);
    x31(i) = mean(row);
end

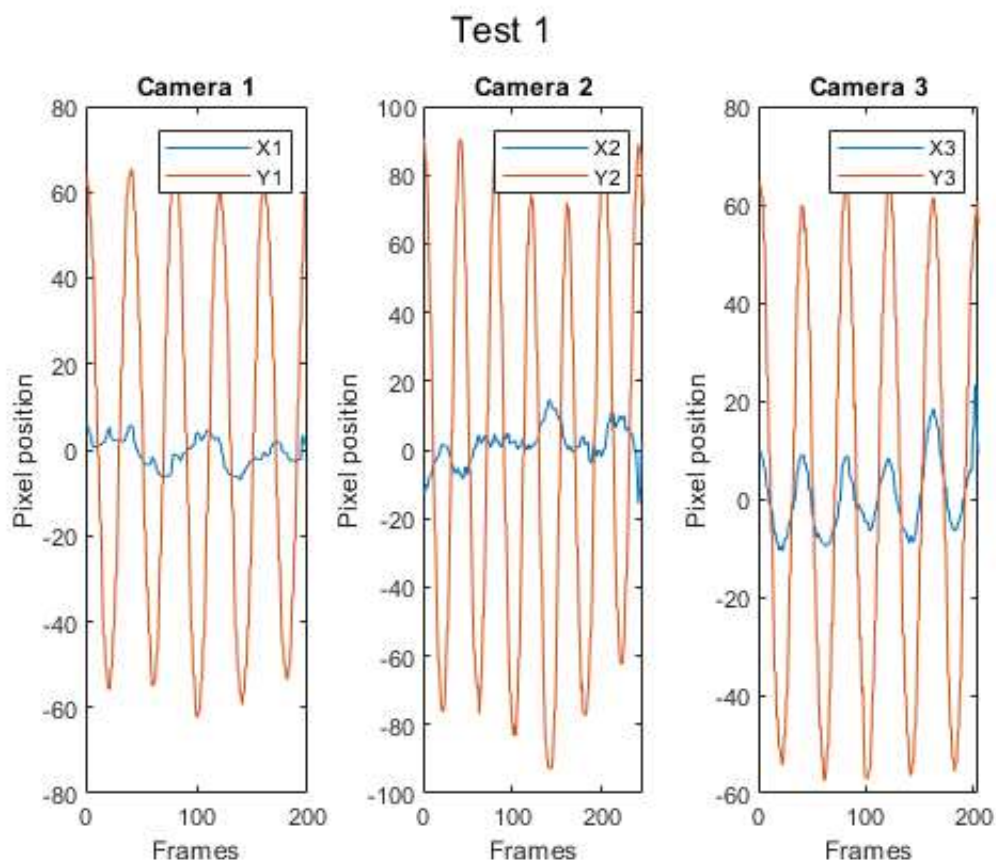
```

```

x31 = x31 - mean(x31);
y31 = y31 - mean(y31);
[M, I] = max(y31(1:50));
x31 = x31(I:end);
y31 = y31(I:end);

subplot(1, 3, 3)
plot(x31);
hold on;
plot(y31);
legend('X3', 'Y3');
title('Camera 3');
xlabel('Frames');
ylabel('Pixel position');
saveas(gcf, 'Position_Test1.jpg')

```



## Reshape data

```

n = min([length(y11), length(y21), length(y31)]);
X = [x11(1:n)'; y11(1:n)'; x21(1:n)'; y21(1:n)'; x31(1:n)'; y31(1:n)'];
[U, S, V] = svd(X/sqrt(n - 1), 'econ');
lambda = diag(S).^2;
Y = U'*X;

figure(2)
set(gca, 'FontSize', 10)
lambdaSum = sum(lambda);
plot(lambda./lambdaSum, 'r*');

```

```

title('Normalized Diagonal Variance For Test 1');
xlabel('Principal Component');
ylabel('Energy Percentage');
saveas(gcf, 'Variance_Test1.jpg');

figure(3)
set(gca, 'FontSize', 10)
plot(Y(1, :));
hold on;
plot(Y(2, :));
plot(Y(3, :));
plot(Y(4, :));
plot(Y(5, :));
plot(Y(6, :));
legend('Component 1', 'Component 2', 'Component 3', 'Component 4', 'Component 5', 'Component 6');
title('Principal Component Projection For Test 1');
xlabel('Frames');
ylabel('Pixel Position');
saveas(gcf, 'Projection_Test1.jpg');

```

