Question 1. Capture an unstructured light field (3 points)

Answer:

I tried circle and zig-zag motion and different distance to record videos.

Figure 1. Circle motion

Figure 2. Zig-zag motion

Question 2. Register the frames of video using template matching (5 points)

Answer:

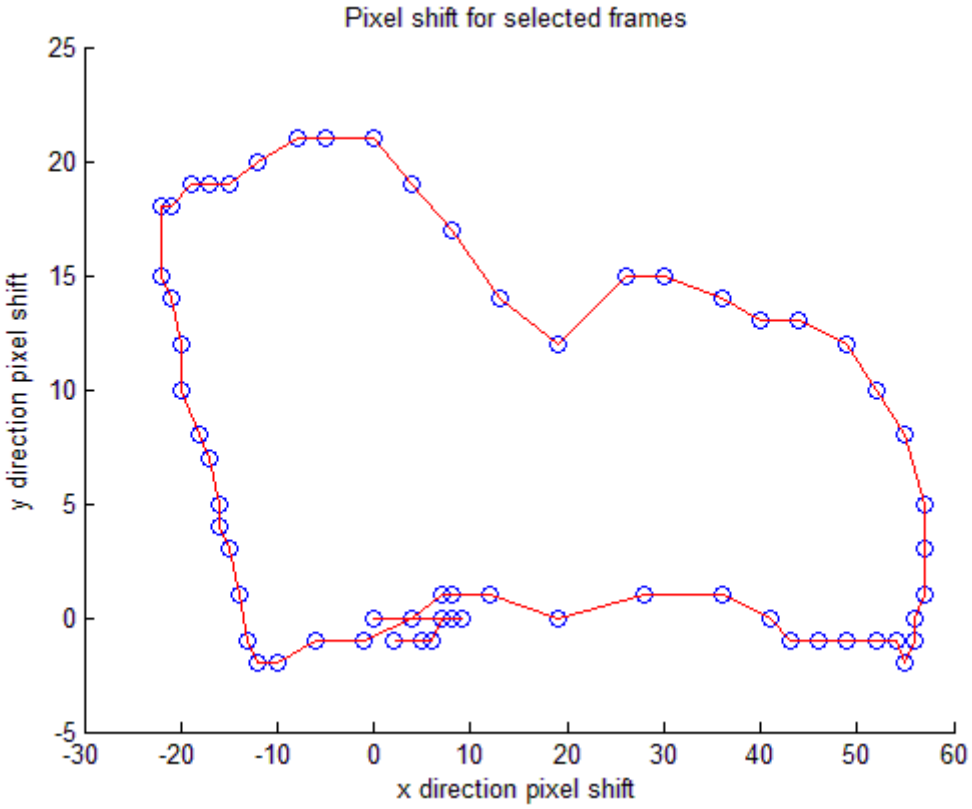

Figure 3. Circle motion

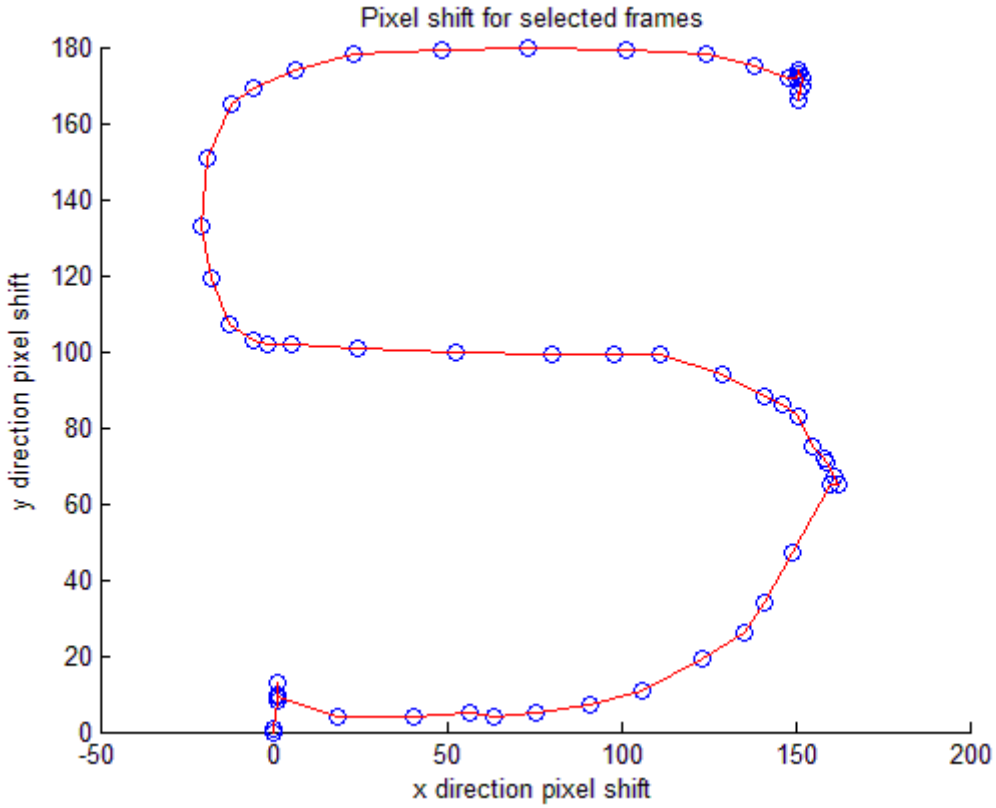

Figure 4. Zig-zag motion

Matlab Codes

```
%%%%%%Circle motion%%%%%%
clc;
clear;
close all;
video=VideoReader('D:\Courses Files_2015_Fall\Introduction to Computational
Photography\HW6\VID_20151129_140828.mp4');
number=video.NumberOfFrames;
n=round(number/5-0.5);
x=zeros(n,1);
y=zeros(n,1);
Frames=cell(n,1);
for i=1:n
    Frames{i}=im2double(rgb2gray(read(video,1+(i-1)*5)));
end
template1=imcrop(Frames{1});
A=normxcorr2(template1,Frames{1});
[a,b]=find(A==max(max(A)));
for i=2:n
    A=normxcorr2(template1,Frames{i});
    [x(i),y(i)]=find(A==max(max(A)));
    x(i)=x(i)-a;
    y(i)=y(i)-b;
end
scatter(y,x,'o');
hold on
plot(y,x,'red');
title('Pixel shift for selected frames');
xlabel('x direction pixel shift');
ylabel('y direction pixel shift');
%%%%%%Zig-zag motion%%%%%%
clc;
clear;
close all;
video=VideoReader('D:\Courses Files_2015_Fall\Introduction to Computational
Photography\HW6\VID_20151129_141450.mp4');
number=video.NumberOfFrames;
n=round(number/5-0.5);
x=zeros(n,1);
y=zeros(n,1);
% n=40;
Frames=cell(n,1);
for i=1:n
```

```
    Frames{i}=im2double(rgb2gray(read(video,1+(i-1)*5)));
end
% imshow(Frames{1});
template1=imcrop(Frames{1});
A=normxcorr2(template1,Frames{1});
[a,b]=find(A==max(max(A)));
for i=2:n
    A=normxcorr2(template1,Frames{i});
    [x(i),y(i)]=find(A==max(max(A)));
    x(i)=x(i)-a;
    y(i)=y(i)-b;
end
scatter(y,x,'o');
hold on
plot(y,x,'red');
title('Pixel shift for selected frames');
xlabel('x direction pixel shift');
ylabel('y direction pixel shift');
```

Question 3&4. Create a synthetic aperture photograph (5 points) and Refocus on a new object (2 points)

Answer:

Figure 5. focus on the perfume(circle)

Figure 6. focus on the pen bag(circle)

Figure 7. focus on the perfume(zig-zag)

Figure 8. focus on the pen bag(zig-zag)

Matlab Codes

```
final=zeros(1080,1920,3);
for i=1:n
    final=final+imtranslate(im2double(read(video,1+(i-1)*5)),[-y(i),-x(i)],'Fillvalues',1);
end
final=final./n;
imshow(final);
imwrite(final,'2.jpg','jpeg')
```