

Appendix A

```
clc
```

```
clear
```

```
close all
```

```
n = 10;
```

```
name_base = 'CIMG';
```

```
img1 = imread('CIMG7934.jpg');
```

```
im1bw = (double(img1(:, :, 1)) + double(img1(:, :, 2)) + double(img1(:, :, 3))) / 3;
```

```
bw_image = uint8(im1bw);
```

```
imshow(bw_image);
```

```
img_inj_sum = zeros(size(im1bw));
```

```
for i = 1 : n
```

```
    name = [name_base num2str(7927 + 7 + i) '.jpg'];
```

```
    img_inj = imread(name);
```

```
    img_inj_sum = img_inj_sum + (double(img_inj(:, :, 1)) + double(img_inj(:, :, 2)) + double(img_inj(:, :, 3))) / 3;
```

```
end
```

```
img_inj_mean = img_inj_sum / n;
```

```
imdif = im1bw - img_inj_mean;
```

```
imdif_inv = 255-(im1bw - img_inj_mean);
```

```
figure(1)
```

```
imshow(uint8(img_inj_mean))
```

```
figure(2)
```

```
imshow(uint8(imdif))
```

```
figure(3)
```

```
imshow(uint8(imdif_inv))
```

```

sum_dx = 0;

sum_dy = 0;

for n = 7193 : 7193 + N-1

    name = ['CIMG' num2str(n) '.jpg'];

    im_raw = imread(name);

    [I, J, d] = size(im_raw);

    for i = 1:I

        for j = 1 : J

            if ( double(im_raw(i,j,1)) > ...

                (double(im_raw(i,j,2)) + double(im_raw(i,j,3)) ))

                i_1 = i;

                j_1 = j;

                break;

            end

        end

    end

end

for i = I:-1:1

    for j = J:-1 : 1

        if ( double(im_raw(i,j,1)) > ...

            (double(im_raw(i,j,2)) + double(im_raw(i,j,3)) ))

            i_2 = i;

            j_2 = j;

            break;

        end

    end

end

```

end

end

dy = - (i_2 - i_1);

dx = j_2 - j_1;

sum_dx = sum_dx + dx;

sum_dy = sum_dy + dy;

end

dx_mean = sum_dx / 8*N

dy_mean = sum_dy / 8*N

sqrt(dx_mean^2+dy_mean^2)