Untitled

April 14, 2019

0.1 Optical Flow implementation

0.2 Name : Nitin kandpal

0.3 Roll Number : 2018802004

```
In [1]: import matplotlib.pyplot as plt
        import numpy as np
        import cv2
```

```
In [ ]: #write the optical flow function with close loop solution
```

```
In [15]: def optical_flow(img1, img2, window_size,mg_thre):

             kernel_x = np.array([[-1., 1.], [-1., 1.]])
             kernel_y = np.array([[-1., -1.], [1., 1.]])
             kernel_t = np.array([[1., 1.], [1., 1.]])
             half_window = int(np.floor(window_size/2))

             magnitude = img1.copy()             # cv2.cvtColor(img1,cv2.COLOR_GRAY2BGR)

             img1 = cv2.cvtColor(img1,cv2.COLOR_BGR2GRAY)
             img2 = cv2.cvtColor(img2,cv2.COLOR_BGR2GRAY)
             #magnitude = np.zeros(img1.shape)
             direction = np.zeros(img2.shape)
             img1 = img1 / 255. # normalize pixels
             img2 = img2 / 255. # normalize pixels

             #calculating fx fy and ft for full image
             Ix = cv2.filter2D(img1,-1,kernel_x)
             Iy = cv2.filter2D(img1,-1,kernel_y)
             It = cv2.filter2D(img1,-1,kernel_t) + cv2.filter2D(img2,-1,-kernel_t)
             u = np.zeros(img1.shape)
             v = np.zeros(img2.shape)

             X = []
             Y = []
             U = []
             V = []
```

```
# within window window_size * window_size
for i in range(half_window, img1.shape[0]-half_window):
    for j in range(half_window, img1.shape[1]-half_window):
        fx = Ix[i-half_window:i+half_window+1, j-half_window:j+half_window+1].flatt
        fy = Iy[i-half_window:i+half_window+1, j-half_window:j+half_window+1].flatt
        ft = It[i-half_window:i+half_window+1, j-half_window:j+half_window+1].flatt

        sum_fx_square = np.sum(np.square(np.multiply(fx,fx)))
        sum_fy_square = np.sum(np.square(np.multiply(fy,fy)))
        sum_fx_fy = np.sum(np.square(np.multiply(fx,fy)))
        sum_fx_ft = np.sum(np.square(np.multiply(fx,ft)))
        sum_fy_ft = np.sum(np.square(np.multiply(fy,ft)))
        whole_sum_fx_fy = np.square(np.sum(np.multiply(fx,fy)))


        #print(sum_fx_square)
        #print(sum_fy_square)
        #print(sum_fx_fy)
        #if (sum_fx_ft > 0):
        #    print(sum_fx_ft)
        #    print(sum_fy_ft)
        #print(whole_sum_fx_fy)

        #Value = np.dot(np.linalg.inv(np.array([[sum_fx_square,sum_fx_fy],[sum_fy_s

        #print (i,j)

        u1 = (- sum_fy_square * sum_fx_ft + sum_fx_fy * sum_fy_ft) / (sum_fx_square
        v1 = (sum_fx_ft* sum_fx_fy - sum_fx_square* sum_fy_ft) / (sum_fx_square * s


        #b = ... # get b here
        #A = ... # get A here
        # if threshold  is larger than the smallest eigenvalue of A'A:
#        nu = ... # get velocity here
        #u[i,j]=u1
        #v[i,j]=v1

        if (np.sqrt(np.square(u1)+ np.square(v1)) > mg_thre):

            #magnitude[i,j] = np.sqrt(np.square(u1)+ np.square(v1))
            #direction[i,j] = np.arctan(v1/u1)

            magnitude[i,j,2] = 255
            magnitude[i,j,1] = 0
            magnitude[i,j,0] = 0
            #direction[i,j] = np.arctan(v1/u1)
```

```
                R = np.sqrt(np.square(u1)+ np.square(v1))
                T = np.arctan(v1/u1)+90


                #u[i,j] = R * np.cos(T)
                #v[i,j] =  R * np.sin(T)

                X.append(j)
                Y.append(i)
                U.append(R * np.cos(T))
                V.append(R * np.sin(T))

                #print (180*np.arctan(v1/u1)/2*np.pi)

    #return magnitude,direction,u,v

    return np.array(X),np.array(Y),np.array(U),np.array(V),magnitude
```

0.3.1 read the images

```
In [ ]: img1_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Army/frame10.png'
        img2_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Army/frame11.png'

        img1 = cv2.imread(img1_path)
        img2 = cv2.imread(img2_path)
        window_size = 3
        X,Y,U,V,magnitude = optical_flow(img1, img2, window_size,1)
        [h,w,c] =img1.shape
        plt.imshow(img1)
        plt.quiver(X, Y, U, V,color='r', linewidth=.5)
        plt.show()
```

```
In [ ]: img1_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Backyard/frame10.png'
        img2_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Backyard/frame11.png'

        img1 = cv2.imread(img1_path)
        img2 = cv2.imread(img2_path)
        window_size = 21
        X,Y,U,V,magnitude = optical_flow(img1, img2, window_size,50)
        [h,w,c] =img1.shape
        plt.imshow(img1)
        plt.quiver(X, Y, U, V,color='r', linewidth=.5)
        plt.show()
```

```
In [ ]: #Evergreen
```

```
In [ ]: img1_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Evergreen/frame10.png'
        img2_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Evergreen/frame11.png'
```

```
         img1 = cv2.imread(img1_path)
         img2 = cv2.imread(img2_path)
         window_size = 21
         X,Y,U,V,magnitude = optical_flow(img1, img2, window_size,50)
         [h,w,c] =img1.shape
         plt.imshow(img1)
         plt.quiver(X, Y, U, V,color='r', linewidth=.5)
         plt.show()
```

```
In [ ]: img1_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Urban/frame10.png'
        img2_path = '/home/lord/cv_assignment/assignment5/eval-data-gray/Urban/frame11.png'

        img1 = cv2.imread(img1_path)
        img2 = cv2.imread(img2_path)
        window_size = 21
        X,Y,U,V,magnitude = optical_flow(img1, img2, window_size,10)
        [h,w,c] =img1.shape
        plt.imshow(img1)
        plt.quiver(X, Y, U, V,color='r', linewidth=.5)
        plt.show()
```

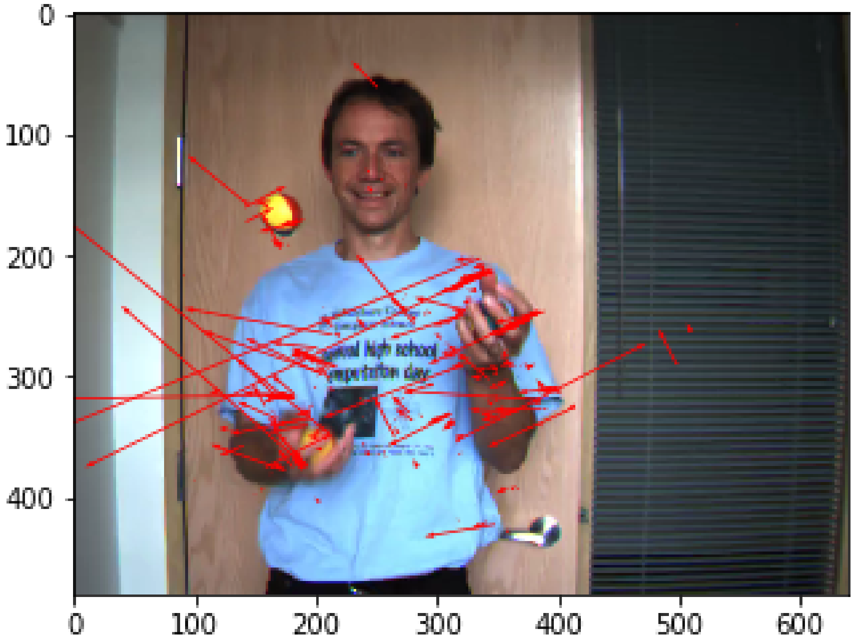
```
In [ ]: #apply the optical flow to segment the moving object in video
        #
```

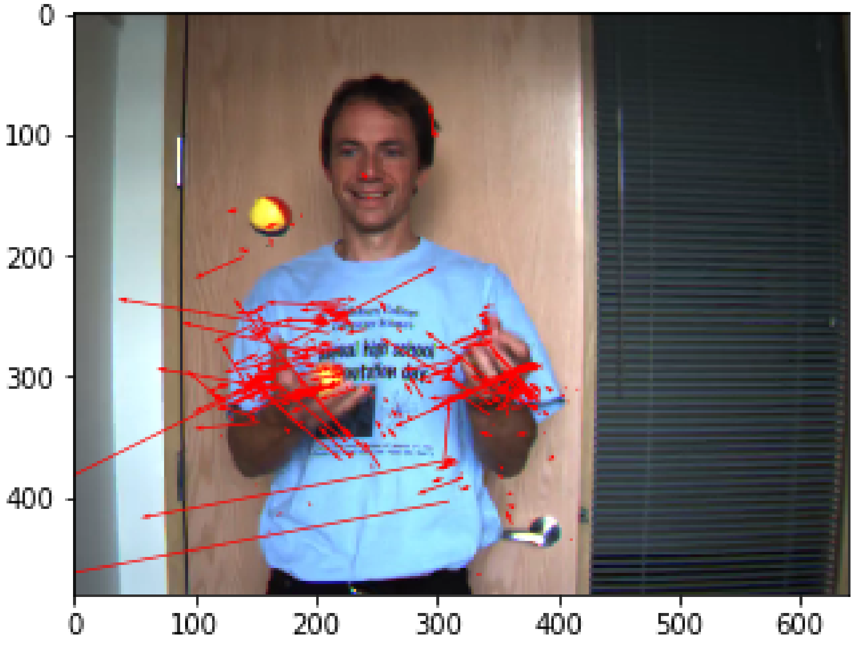
```
In [ ]: #path_to_video = '/home/lord/cv_assignment/assignment5/Beanbags/%d.png'

        path_to_video = '/home/lord/cv_assignment/assignment5/Beanbags/.mp4'
```

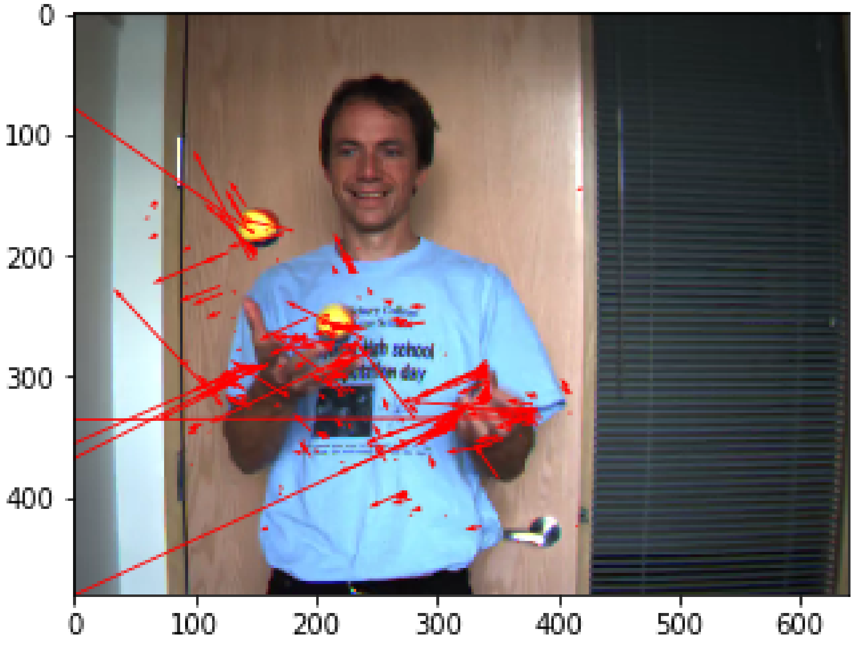
```
In [20]: import skvideo.io
         videogen = skvideo.io.vreader('/home/lord/cv_assignment/assignment5/Beanbags/ball.mp4')
         count = 0
         for frame in videogen:

             if (count >0):


                 frame1 = frame_old.copy()


                 window_size = 21
                 X,Y,U,V,magnitude = optical_flow(frame1, frame, window_size,100)
                 [h,w,c] =frame.shape
                 plt.imshow(frame1)
                 plt.quiver(X, Y, U, V,color='r', linewidth=.5)
                 plt.show()


             count = count+1
```

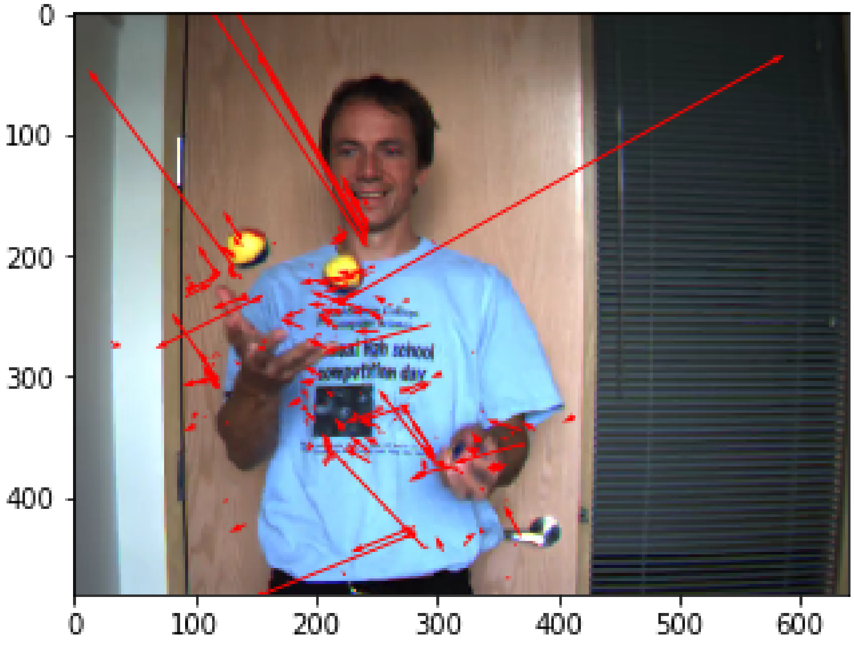
```
        frame_old = frame.copy()
```

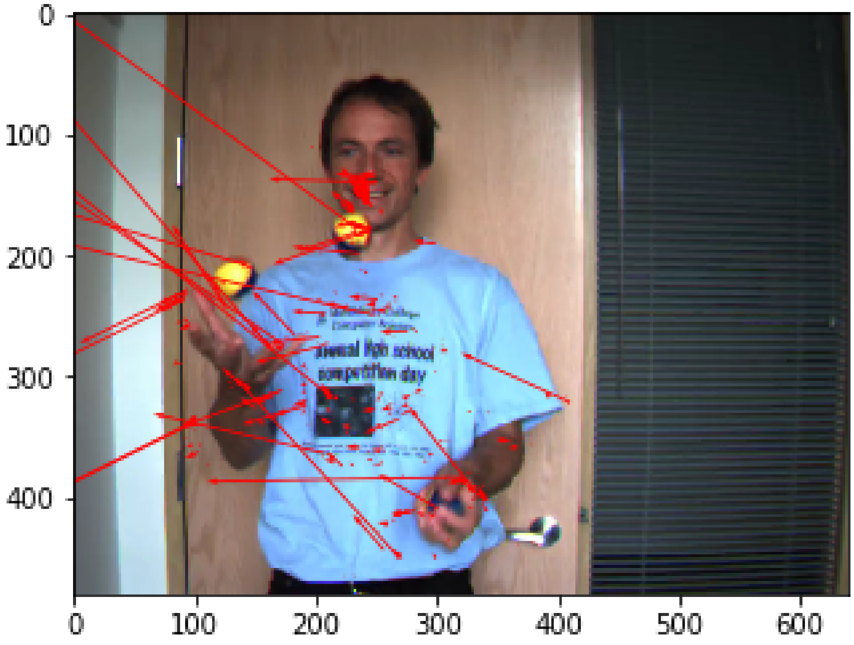
```
/home/lord/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:56: RuntimeWarning: inval
/home/lord/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:57: RuntimeWarning: inval
```

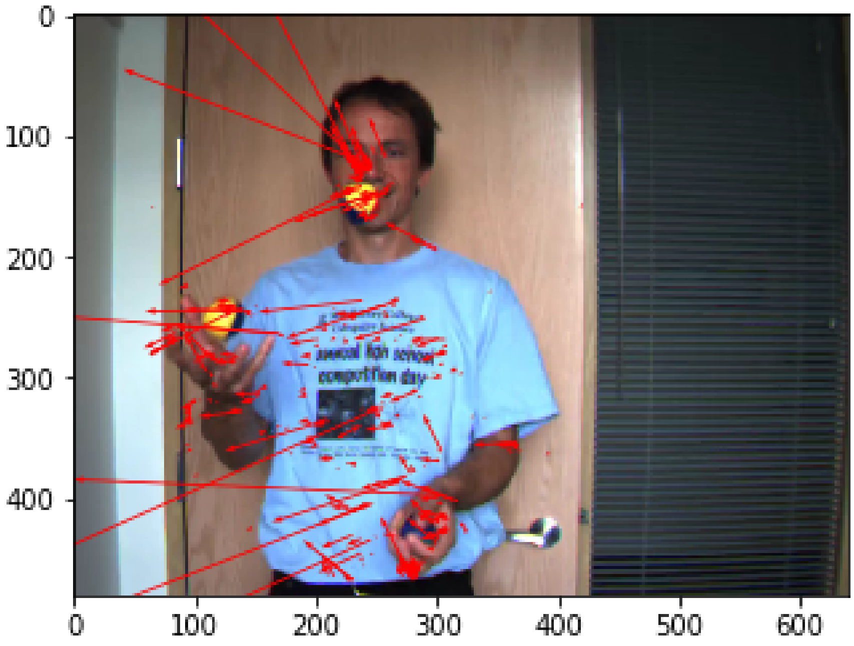


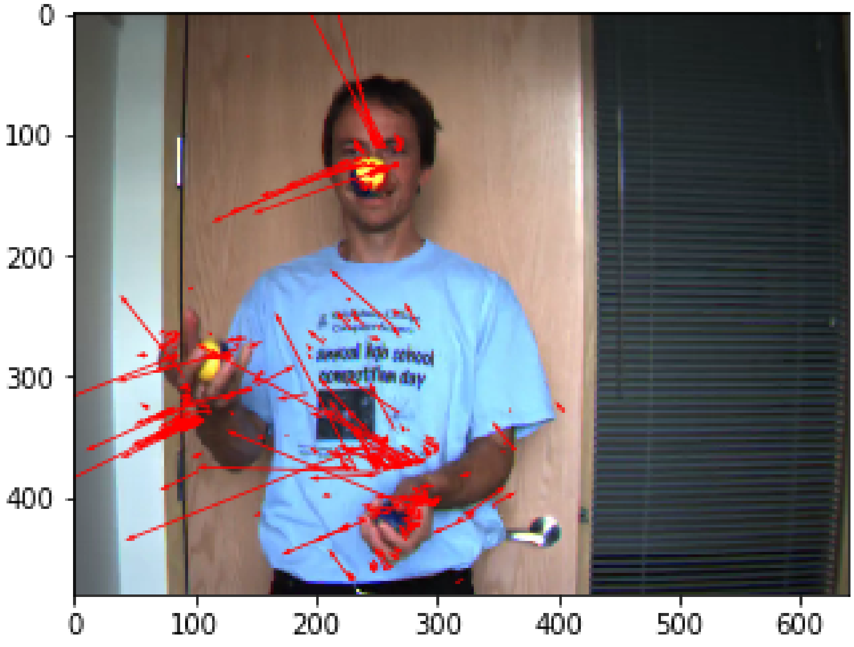

0
100
200
300
400
0
100
200
300
400
500
600


0
100
200
300
400
0
100
200
300
400
500
600


0
100
200
300
400
0
100
200
300
400
500
600


0
100
200
300
400
0
100
200
300
400
500
600


0
100
200
300
400
0
100
200
300
400
500
600


0
100
200
300
400
0
100
200
300
400
500
600