Assignment 5

1. key frame selection technique for video summarization

Obtain the adaptive threshold using the mean of the statistical differences of each batch with its corresponding standard deviation. Investigate and discuss the influence of changing the batch size using: [15 points]

a) 29 frames:

Starting at 29 frames, 368/725 key frames were selected. There was very noticeable difference in between each batch size of the frames in the video.

```
diff = []
for i in range(29,len(frames)-1):
    # print(frames[i],frames[i+1])
    #appending only the difference between frames
    diff.append(cv2.absdiff(frames[i],frames[i+1]))
```

```
#Output of Histogram values of each frame captured
#each frame has 3 arrays for RGB color defining the color of the image and need to
 calculate "intra-array mean" which are value of RGB values for the captured images
np.mean(diff)
```

```
13.186805850458523
```

```
#returns mean value
mn= np.mean(diff)
#returns the standaerd deviation
st_d=np.std(diff)
print('mean:',mn,'\nstandard dev:',st_d)
```

```
mean: 13.186805850458523
standard dev: 56.46896176953525
```

```
#Threshold calculation
#setting a random value
a = 4
#deefining the standard threshold value for the project/global threshold value
ts = mn+(a*st_d)
print('threshold:',ts)
```

```
threshold: 239.0626529285995
```

```
print('frames:',(len(frames)))
print('keyframe:',(len(key_fr)))
```

```
frames: 725
keyframe: 368
```

```
for i in range(29, len(diff)):
    #calculate and append mean, standard deviation, and threshold
     values
    mn = np.mean(diff[i])
    st_d = np.std(diff[i])
    fr_ts = mn + (4 * st_d)
    print('frame:', i, ':[threshold:', fr_ts, ']')
    a_fr.append([i, fr_ts])
```

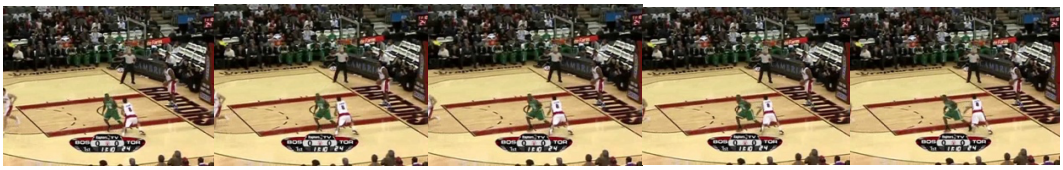
```
frame: 29 :[threshold: 242.86428198881083 ]\nframe: 30 :[th...
```

```
imp_fr = []
#loop on the list obtained previously
for i, ac_tr in (a_fr):
    #compare threshold values to the standard threshold
    if ac_tr >= ts:
        print('frame:', i, ':[threshold:', ac_tr, ']')
        #append list with the imp frames based on their index and
         values
        imp_fr.append([i, ac_tr])
```

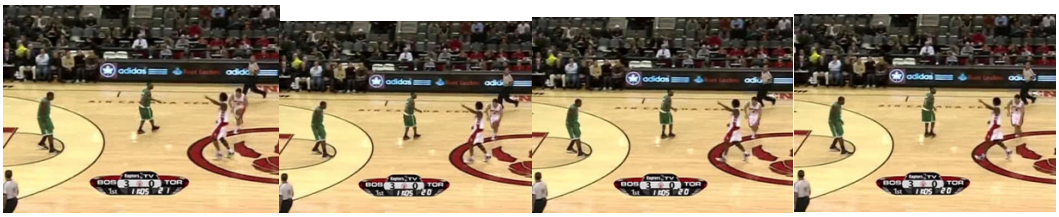
```
frame: 88 :[threshold: 249.58926295410117 ]
frame: 89 :[threshold: 245.60832511050745 ]
frame: 90 :[threshold: 240.4119912966775 ]
frame: 91 :[threshold: 239.622832518887 ]
frame: 92 :[threshold: 240.75466354554163 ]
frame: 243 :[threshold: 242.0926819409087 ]
frame: 244 :[threshold: 248.83956731488786 ]
frame: 245 :[threshold: 246.74748298923302 ]
frame: 246 :[threshold: 245.83478982616842 ]
frame: 247 :[threshold: 249.82973235299124 ]
frame: 248 :[threshold: 252.8459753644759 ]
frame: 249 :[threshold: 253.53933481376333 ]
frame: 250 :[threshold: 253.23239856773455 ]
frame: 251 :[threshold: 255.23353798237727 ]
```

Key frame:

From: 88 - 92



From: 243 – 246



b) 145 frames

From 145 frames 299/725 total key frames were selected. There was not much difference in batch size of the frames in video.

```
diff = []
for i in range(145,len(frames)-1):
    # print(frames[i],frames[i+1])
    #appending only the difference between frames
    diff.append(cv2.absdiff(frames[i],frames[i+1]))
```

```
#Output of Histogram values of each frame captured
#each frame has 3 arrays for RGB color defining the color of the image and need to ,
calculate "intra-array mean" which are value of RGB values for the captured images
np.mean(diff)
```

```
13.439670867682413
```

```
#returns mean value
mn= np.mean(diff)
#returns the standaerd deviation
st_d=np.std(diff)
print('mean:',mn,'\nstandard dev:',st_d)
```

```
mean: 13.439670867682413
standard dev: 56.97798976997495
```

```
#Threshold calculation
#setting a random value
a = 4
#deefining the standard threshold value for the project/global threshold value
ts = mn+(a*st_d)
print('threshold:',ts)
```

```
threshold: 241.3516299475822
```

```
print('frames:',(len(frames)))
print('keyframe:',(len(key_fr)))
```

```
frames: 725
keyframe: 299
```

Key frames selected:

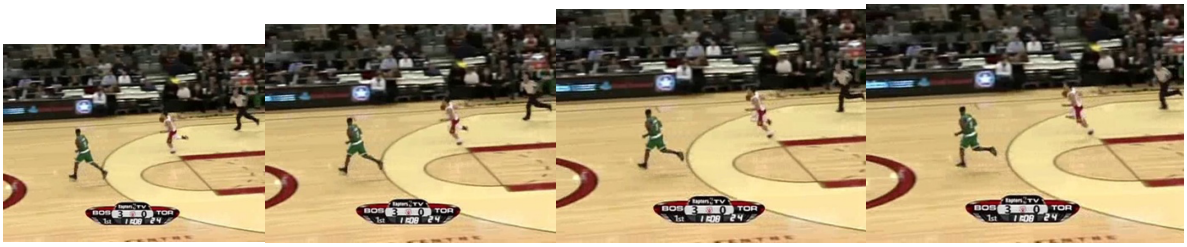
```
##Extracting the frames
a_fr = []
for i in range(145, len(diff)):
    #calculate and append mean, standard deviation, and threshold
     values
    mn = np.mean(diff[i])
    st_d = np.std(diff[i])
    fr_ts = mn + (4 * st_d)
    print('frame:', i, ':[threshold:', fr_ts, ']')
    a_fr.append([i, fr_ts])
```

```
frame: 145 :[threshold: 252.87234228350798 ]\nframe: 146 :[...
```

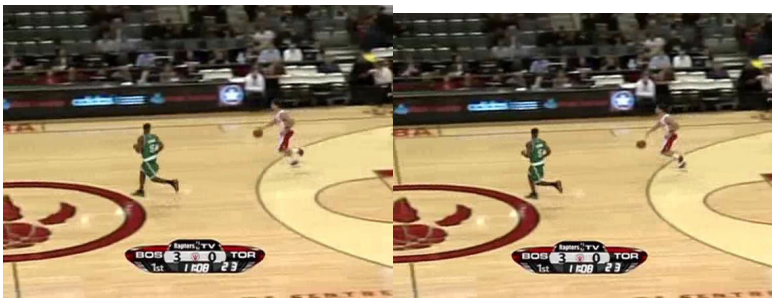
```
imp_fr = []
#loop on the list obtained previously
for i, ac_tr in (a_fr):
    #compare threshold values to the standard threshold
    if ac_tr >= ts:
        print('frame:', i, ':[threshold:', ac_tr, ']')
        #append list with the imp frames based on their index and
         values
        imp_fr.append([i, ac_tr])
```

```
frame: 145 :[threshold: 252.87234228350798 ]
frame: 146 :[threshold: 252.32683266588882 ]
frame: 147 :[threshold: 244.16284522234943 ]
frame: 148 :[threshold: 250.38099839038938 ]
frame: 153 :[threshold: 245.91626347004984 ]
frame: 158 :[threshold: 246.63923013254308 ]
frame: 159 :[threshold: 247.7374813409764 ]
```

Frame: 145 – frame: 148



Frame: 153 - 158



c) The whole video frames

From 0 frame, 382/725 key frames were selected. There was little to no noticeable difference in the video.

```
diff = []
for i in range(0,len(frames)-1):
    # print(frames[i],frames[i+1])
    #appending only the difference between frames
    diff.append(cv2.absdiff(frames[i],frames[i+1]))
```

```
#Output of Histogram values of each frame captured
#each frame has 3 arrays for RGB color defining the color of the image and need to
calculate "intra-array mean" which are value of RGB values for the captured images
np.mean(diff)
```

```
13.171907688632896
```

```
#returns mean value
mn= np.mean(diff)
#returns the standaerd deviation
st_d=np.std(diff)
print('mean:',mn,'\nstandard dev:',st_d)
```

```
mean: 13.171907688632896
standard dev: 56.438792584919106
```

```
#Threshold calculation
#setting a random value
a = 4
#deefining the standard threshold value for the project/global threshold value
ts = mn+(a*st_d)
print('threshold:',ts)
```

```
threshold: 238.92707802830932
```

```
print('frames:',(len(frames)))
print('keyframe:',(len(key_fr)))
```

```
frames: 725
keyframe: 382
```