

```
import cv2
import os
import numpy as np
import matplotlib.pyplot as plt

# Paths
video_path = r"/content/Dubai _ Dubai in 15 seconds.mp4"
frames_path = r"/content/frames"

# Create frames directory if it doesn't exist
if not os.path.exists(frames_path):
    os.makedirs(frames_path)

# Convert video to frames
cap = cv2.VideoCapture(video_path)
frames = []
frame_count = 0

while cap.isOpened():
    ret, frame = cap.read()
    if not ret:
        break
    frames.append(frame)
    frame_count += 1

cap.release()

# Convert frames to HSV
def convert_to_hsv(frames):
    return [cv2.cvtColor(frame, cv2.COLOR_BGR2HSV) for frame in frames]

hsv_frames = convert_to_hsv(frames)

# Noise reduction
def noise_reduction(frame):
    kernel = np.ones((5, 5), np.float32) / 25
    return cv2.filter2D(frame, -1, kernel)

def denoise_frames(frames):
    return [noise_reduction(frame) for frame in frames]

denoised_frames = denoise_frames(hsv_frames)

# Modified: Ensure histograms are in float32
def calculate_histogram(frame):
    hist = np.zeros((256, 3), dtype=np.float32)
    for i in range(3):
        hist[:, i] = cv2.calcHist([frame], [i], None, [256], [0, 256]).astype(np.float32).flatten()
    return hist

# Hard cut detection (using histogram correlation)
def detect_scene_cuts(frames, threshold=0.9):
    previous_hist = None
    scene_cut_frames = []
    for idx, frame in enumerate(frames):
        hist = calculate_histogram(frame)
        if previous_hist is not None:
            # Calculate correlation between current and previous frame histograms
            # This part is missing from the provided code snippet
```

```

score = max(cv2.compareHist(previous_hist, hist, cv2.HISTCMP_CORREL), 0)
if score < threshold:
    print(f"Scene cut detected at frame {idx} with score: {score}")
    scene_cut_frames.append(idx)
previous_hist = hist
return scene_cut_frames

# Soft cut detection (based on frame intensity differences)
def detect_soft_cuts(frames, threshold=25.0):
    soft_cut_frames = []
    previous_frame = cv2.cvtColor(frames[0], cv2.COLOR_BGR2GRAY)
    for idx in range(1, len(frames)):
        current_frame = cv2.cvtColor(frames[idx], cv2.COLOR_BGR2GRAY)
        # Measure frame-to-frame intensity difference
        diff = cv2.absdiff(current_frame, previous_frame)
        mean_diff = np.mean(diff)
        if mean_diff > threshold:
            print(f"Soft cut detected at frame {idx} with mean difference: {mean_diff}")
            soft_cut_frames.append(idx)
        previous_frame = current_frame
    return soft_cut_frames

# Sobel edge detection
def sobel_filters(image):
    Kx = np.array([[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]])
    Ky = np.array([[1, 2, 1], [0, 0, 0], [-1, -2, -1]])
    Ix = cv2.filter2D(image, -1, Kx)
    Iy = cv2.filter2D(image, -1, Ky)
    G = np.hypot(Ix, Iy)
    G_max = G.max()
    if G_max > 0:
        G = G / G_max * 255
    else:
        G = np.zeros_like(G)
    return G

def sobel_edge_detection(frame):
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    edge_frame = sobel_filters(gray)
    return edge_frame

# Detect Scene Cuts with adjusted thresholds
hard_cut_frames = detect_scene_cuts(denoised_frames, threshold=0.9)
soft_cut_frames = detect_soft_cuts(denoised_frames, threshold=25.0)

# Combine hard and soft cut frames
scene_cut_frames = sorted(set(hard_cut_frames + soft_cut_frames))

# Process and display only scene cut frames with Sobel edge detection
for cut_frame in scene_cut_frames:
    cut_image = frames[cut_frame]

    # Apply Sobel edge detection
    edge_frame = sobel_edge_detection(cut_image)

    # Convert BGR to RGB for displaying
    cut_image_rgb = cv2.cvtColor(cut_image, cv2.COLOR_BGR2RGB)

    # Plot the original scene cut frame
    plt.figure(figsize=(8, 6))

```

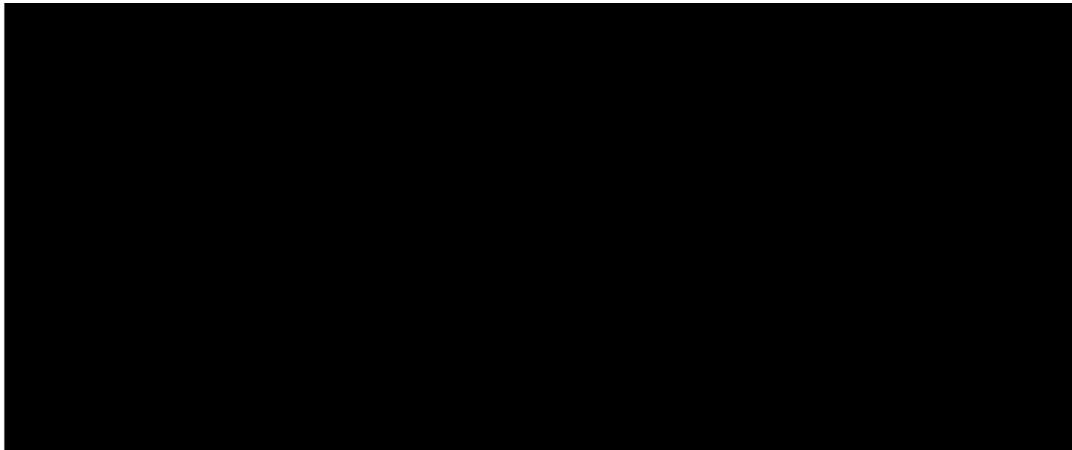
```
plt.imshow(cut_image_rgb)
plt.title(f"Scene Cut Frame: {cut_frame}")
plt.axis('off')
plt.show()

# Plot the Sobel edge-detected frame
plt.figure(figsize=(8, 6))
plt.imshow(edge_frame, cmap='gray')
plt.title(f"Sobel Edge Detection: {cut_frame}")
plt.axis('off')
plt.show()
```

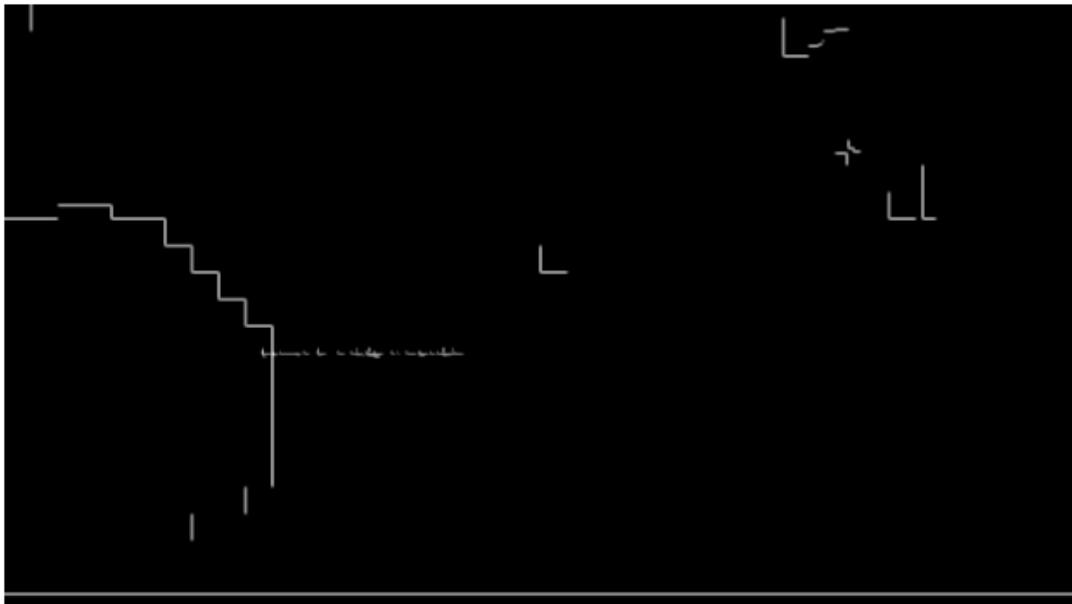
Scene cut detected at frame 91 with score: 0.7415325606342406
Scene cut detected at frame 107 with score: 0
Scene cut detected at frame 108 with score: 0.40838455108774413
Scene cut detected at frame 109 with score: 0.5765413273796174
Scene cut detected at frame 110 with score: 0.7542180241733957
Scene cut detected at frame 144 with score: 0.7135435137001932
Scene cut detected at frame 145 with score: 0.6124203951575959
Scene cut detected at frame 146 with score: 0.5099944163803334
Scene cut detected at frame 148 with score: 0.5134932142843448
Scene cut detected at frame 149 with score: 0.38885200992060603
Scene cut detected at frame 150 with score: 0.25051690669791626
Scene cut detected at frame 151 with score: 0.7409379026201536
Scene cut detected at frame 152 with score: 0.3046913390052815
Scene cut detected at frame 154 with score: 0.7071940096543454
Scene cut detected at frame 155 with score: 0.7635755164586717
Scene cut detected at frame 156 with score: 0.858371036190228
Scene cut detected at frame 157 with score: 0.8715705609987671
Scene cut detected at frame 158 with score: 0.8856271382472033
Scene cut detected at frame 197 with score: 0.8790124721063426
Scene cut detected at frame 198 with score: 0.8000992108607088
Scene cut detected at frame 199 with score: 0.7321050318431701
Scene cut detected at frame 200 with score: 0.6035746462633051
Scene cut detected at frame 202 with score: 0.3851461168315363
Scene cut detected at frame 203 with score: 0.7076189986032669
Scene cut detected at frame 204 with score: 0.31683146372097043
Scene cut detected at frame 205 with score: 0.5525907388629704
Scene cut detected at frame 206 with score: 0.6928721749478685
Scene cut detected at frame 208 with score: 0.7632150438950903
Scene cut detected at frame 209 with score: 0.8075256970894961
Scene cut detected at frame 210 with score: 0.8575705742683642
Scene cut detected at frame 251 with score: 0.10718721901651995
Scene cut detected at frame 276 with score: 0.1310112687386806
Scene cut detected at frame 299 with score: 0.26462467230115005
Scene cut detected at frame 311 with score: 0.33296624610935116
Scene cut detected at frame 335 with score: 0.10093734901358034
Scene cut detected at frame 346 with score: 0.0965157968259421
Scene cut detected at frame 371 with score: 0.07525724820562818
Scene cut detected at frame 395 with score: 0.09034262743326607
Scene cut detected at frame 408 with score: 0.16216951158999926
Scene cut detected at frame 431 with score: 0.20882577992861437
Scene cut detected at frame 438 with score: 0.8429029361333912
Scene cut detected at frame 439 with score: 0.7649209252044915
Scene cut detected at frame 440 with score: 0.7622466346844855
Scene cut detected at frame 442 with score: 0.6209420823190662
Soft cut detected at frame 107 with mean difference: 84.58932291666666
Soft cut detected at frame 151 with mean difference: 54.99677517361111
Soft cut detected at frame 203 with mean difference: 52.06012152777778
Soft cut detected at frame 204 with mean difference: 43.593250868055556
Soft cut detected at frame 251 with mean difference: 56.68810763888889
Soft cut detected at frame 276 with mean difference: 64.69734809027777
Soft cut detected at frame 299 with mean difference: 57.86969618055556
Soft cut detected at frame 311 with mean difference: 46.69789930555555
Soft cut detected at frame 335 with mean difference: 44.52318576388889
Soft cut detected at frame 346 with mean difference: 44.84784722222222
Soft cut detected at frame 371 with mean difference: 66.35613715277778
Soft cut detected at frame 395 with mean difference: 67.27688368055556
Soft cut detected at frame 408 with mean difference: 29.5280381944444445
Soft cut detected at frame 431 with mean difference: 36.73744357638889

Scene Cut Frame: 91

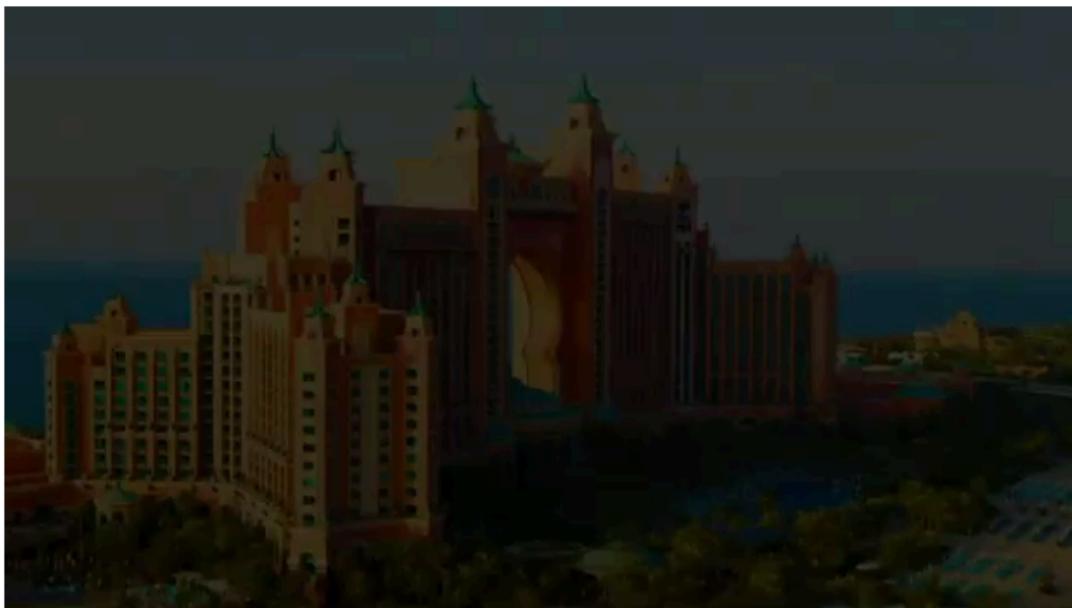




Sobel Edge Detection: 91



Scene Cut Frame: 107



Sobel Edge Detection: 107





Scene Cut Frame: 108



Sobel Edge Detection: 108



Scene Cut Frame: 109

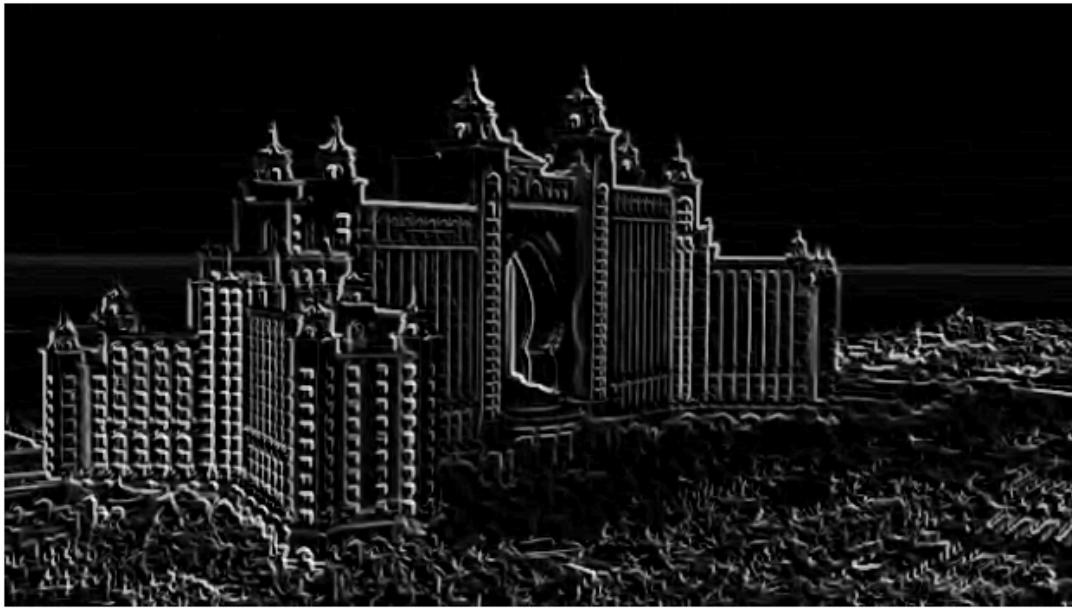


Sobel Edge Detection: 109

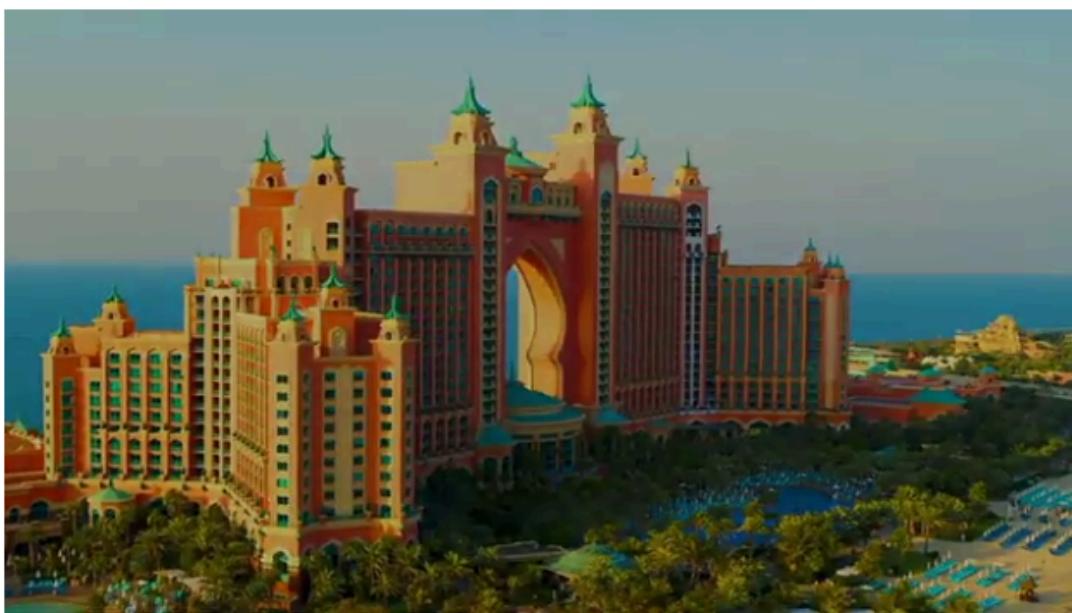


Scene Cut Frame: 110



Sobel Edge Detection: 110**Scene Cut Frame: 144****Sobel Edge Detection: 144**

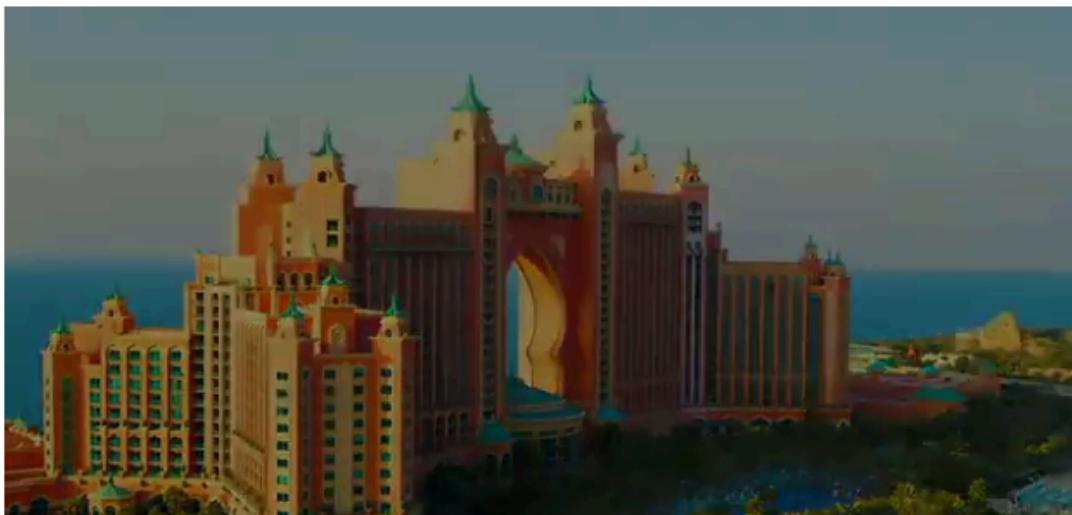
Scene Cut Frame: 145

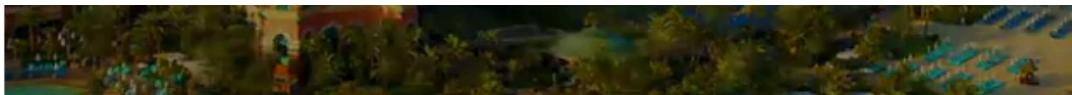


Sobel Edge Detection: 145



Scene Cut Frame: 146

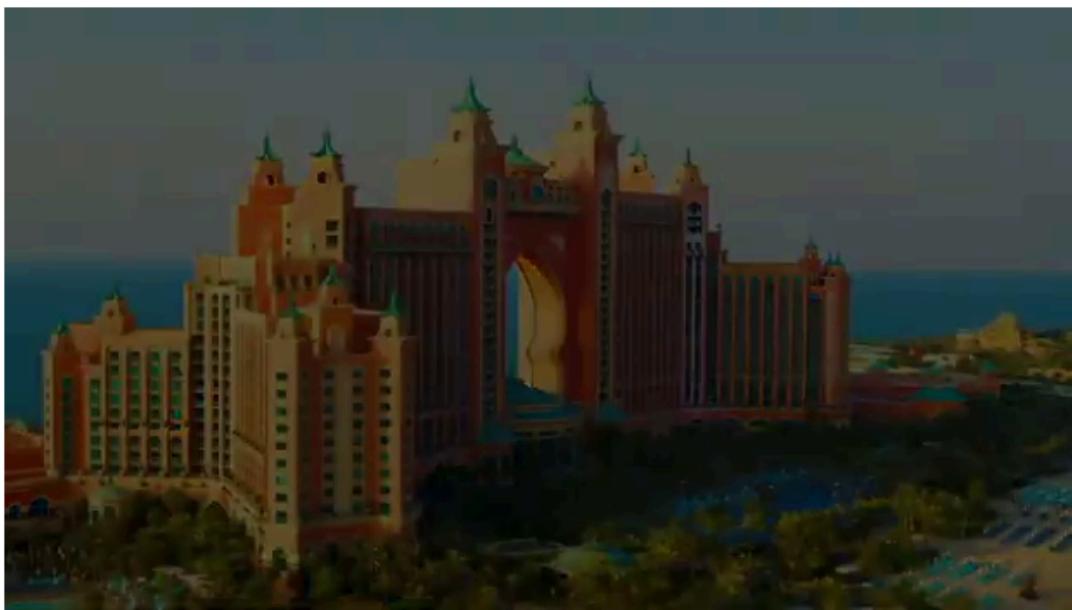




Sobel Edge Detection: 146



Scene Cut Frame: 148

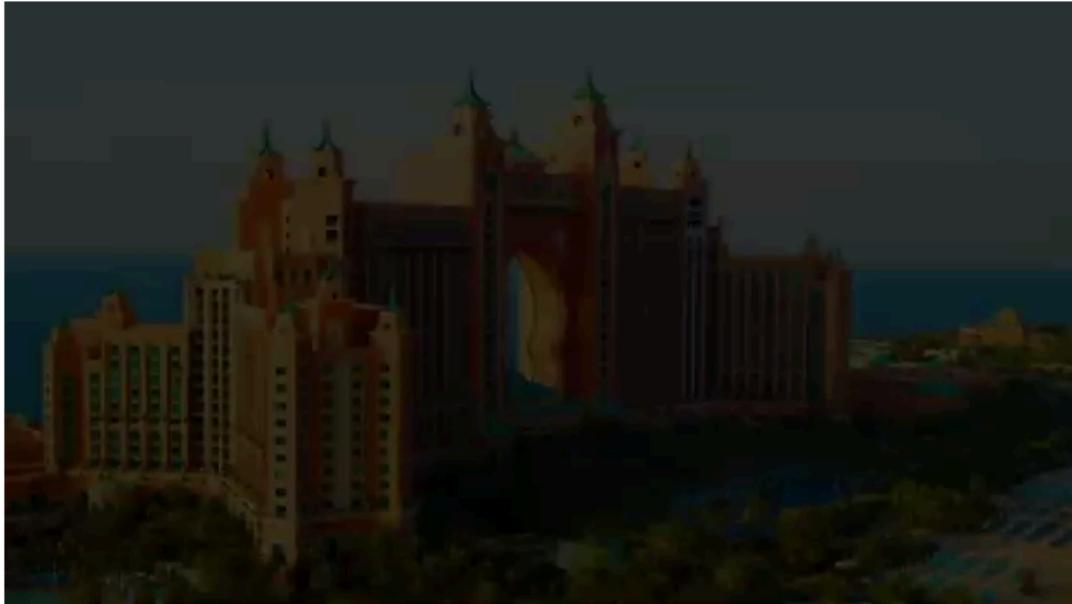


Sobel Edge Detection: 148





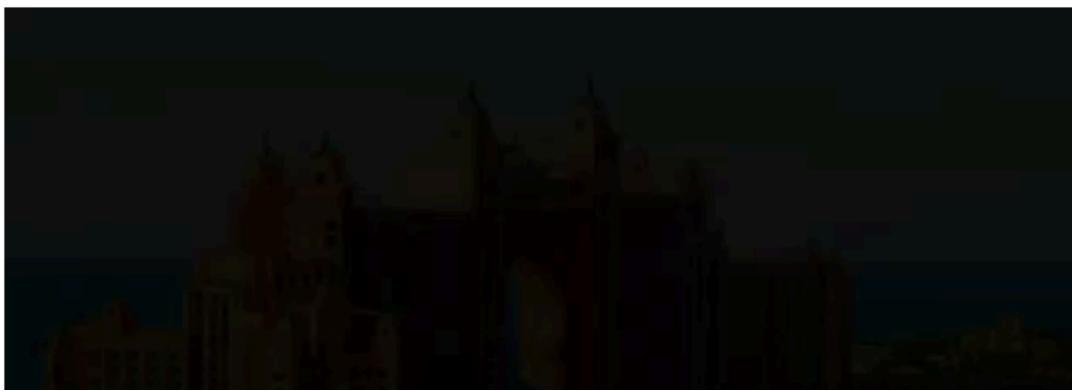
Scene Cut Frame: 149



Sobel Edge Detection: 149



Scene Cut Frame: 150

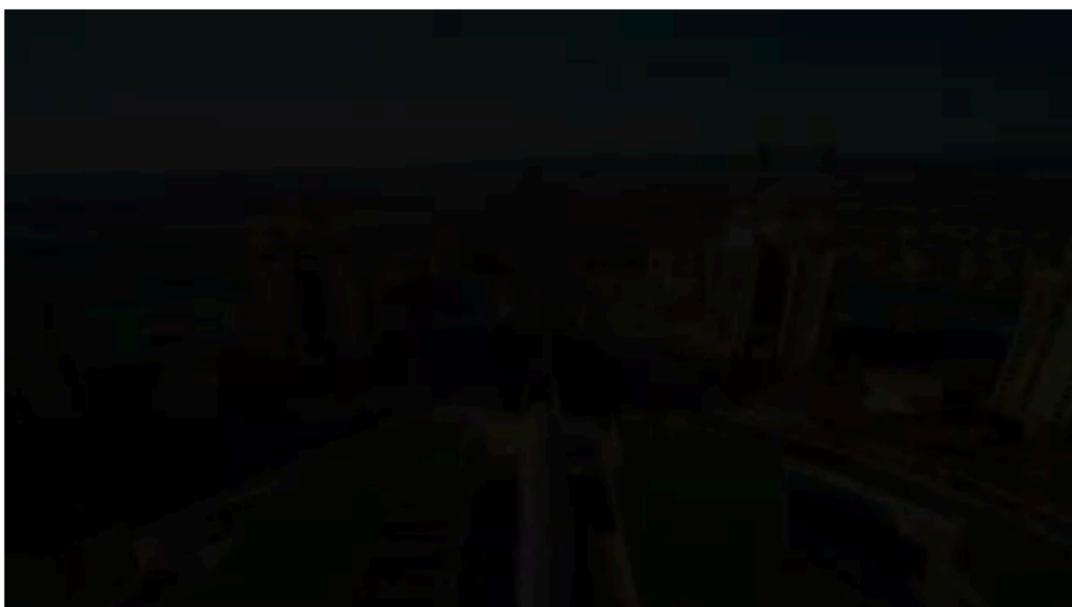




Sobel Edge Detection: 150

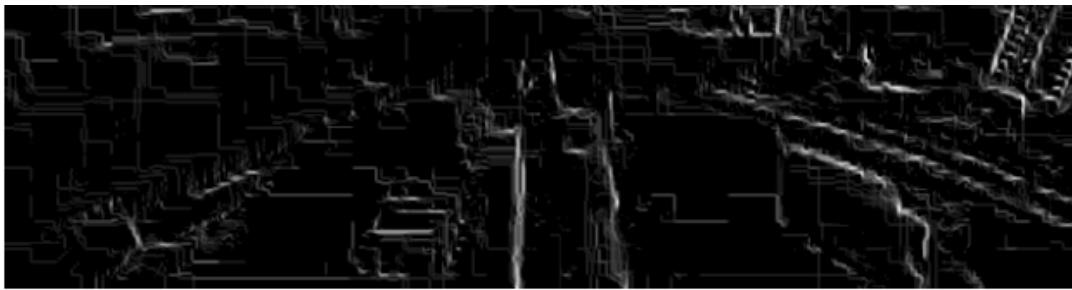


Scene Cut Frame: 151

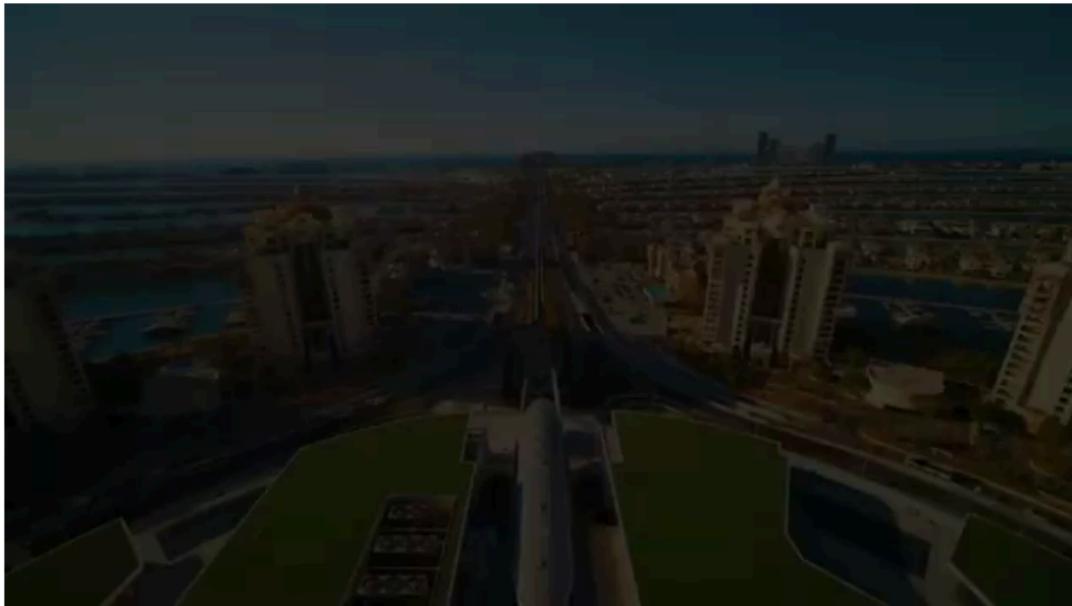


Sobel Edge Detection: 151

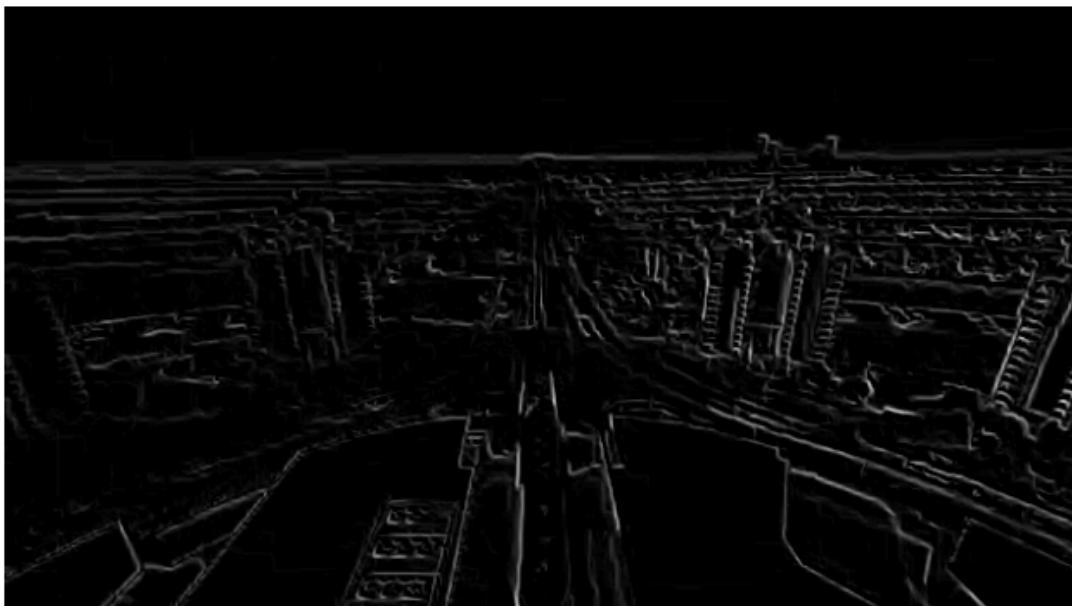




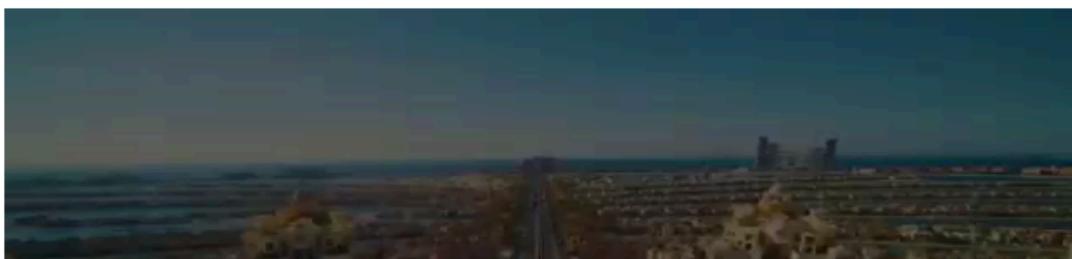
Scene Cut Frame: 152

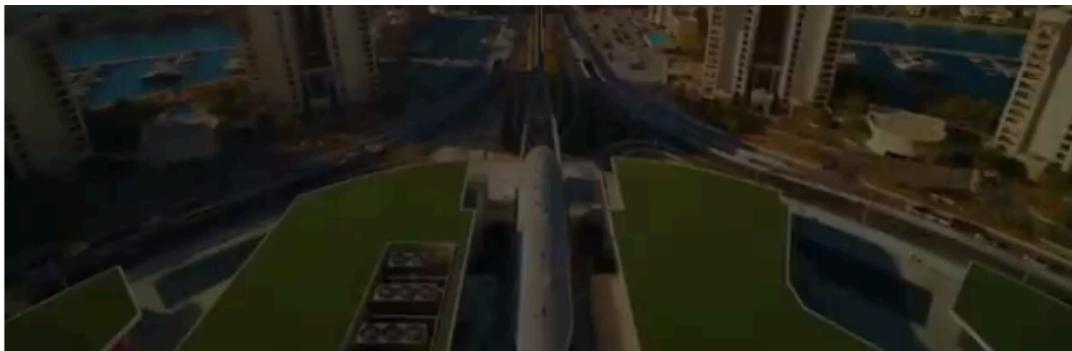


Sobel Edge Detection: 152

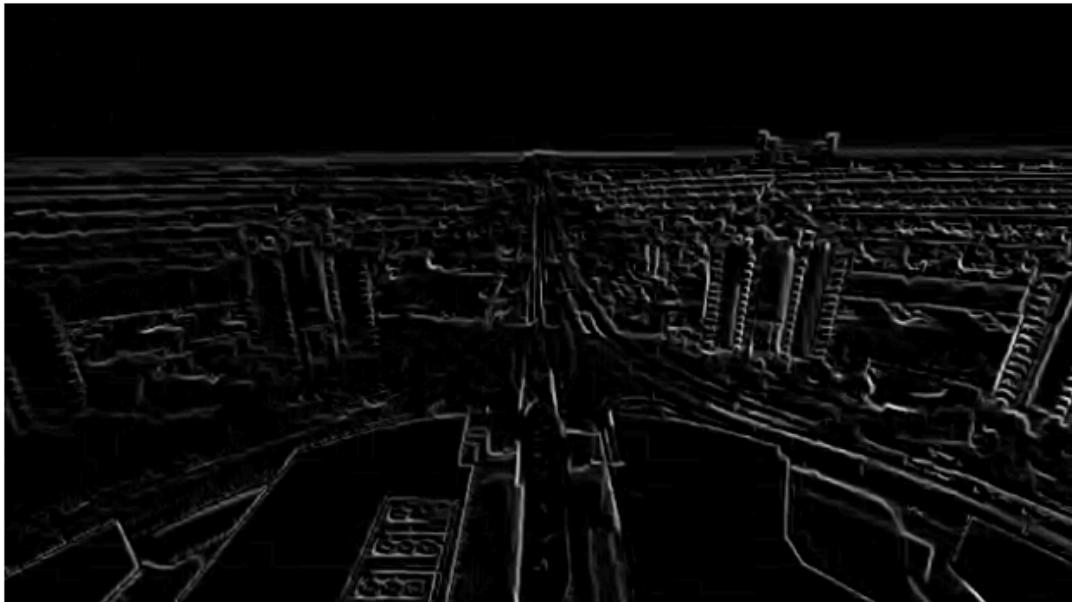


Scene Cut Frame: 154

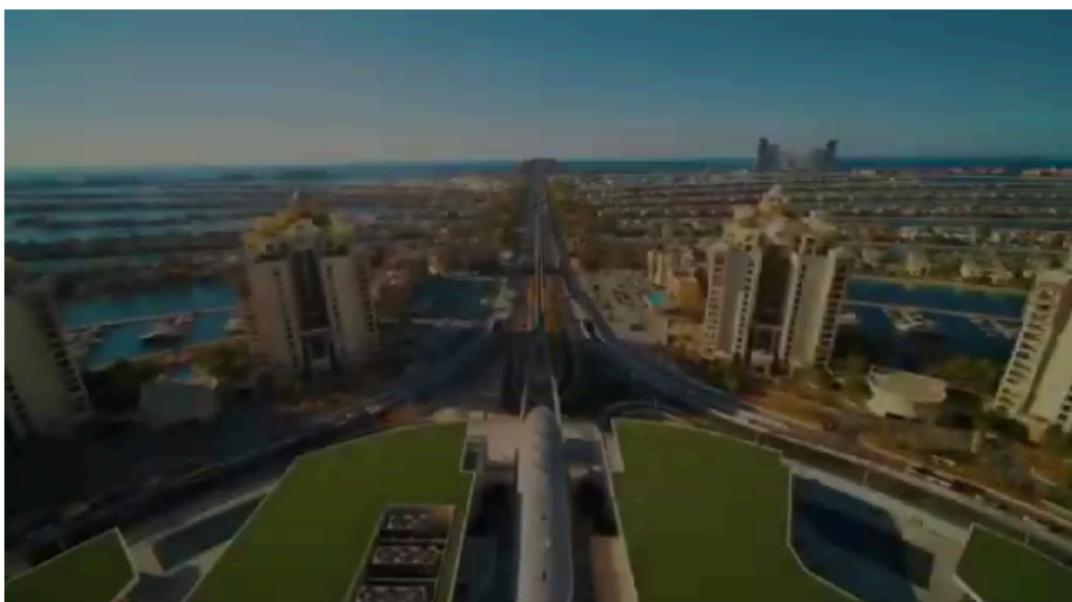




Sobel Edge Detection: 154

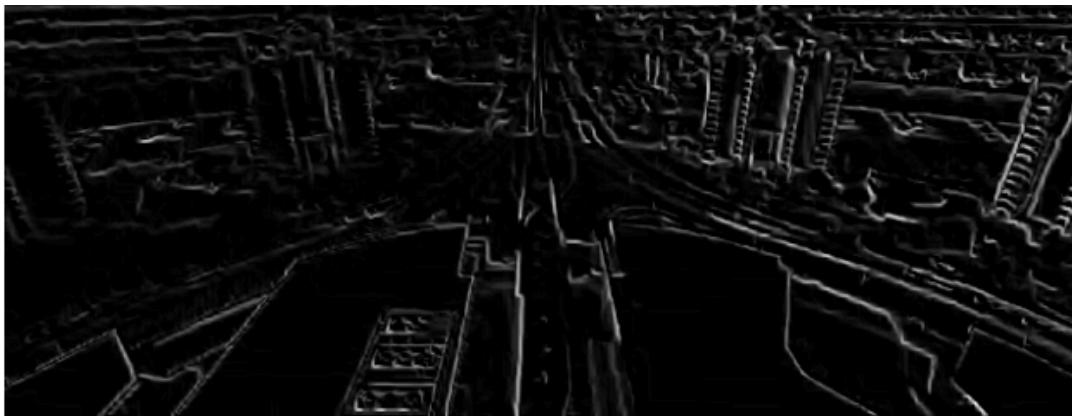


Scene Cut Frame: 155



Sobel Edge Detection: 155

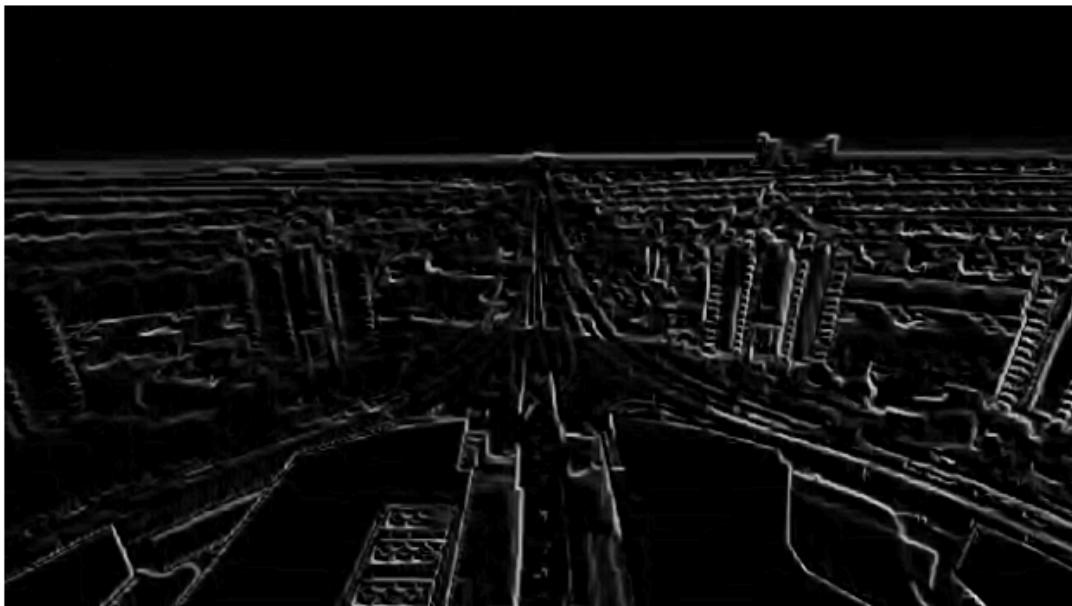




Scene Cut Frame: 156



Sobel Edge Detection: 156

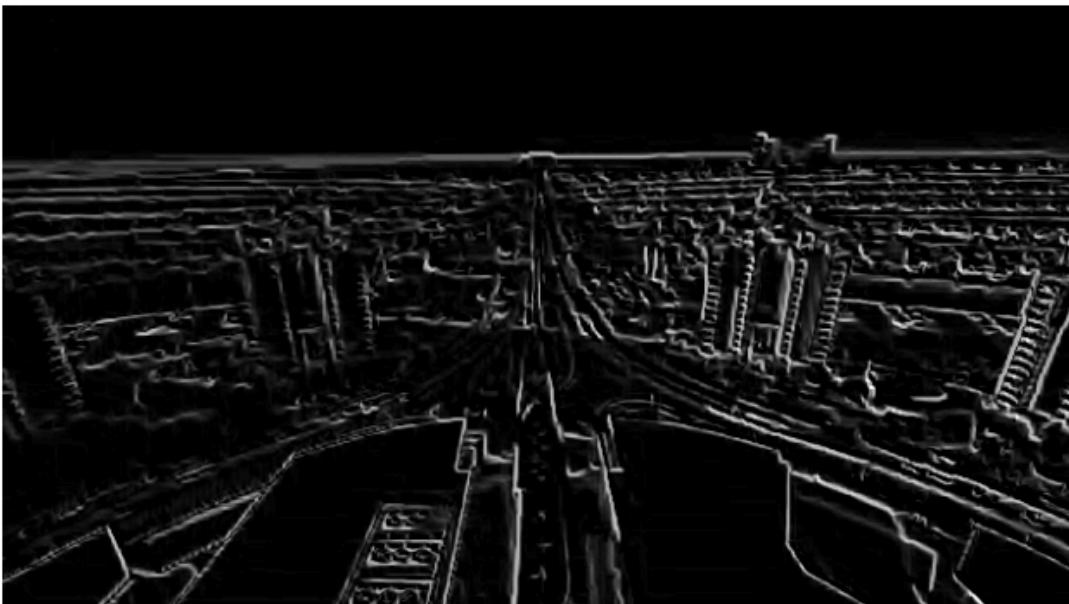


Scene Cut Frame: 157





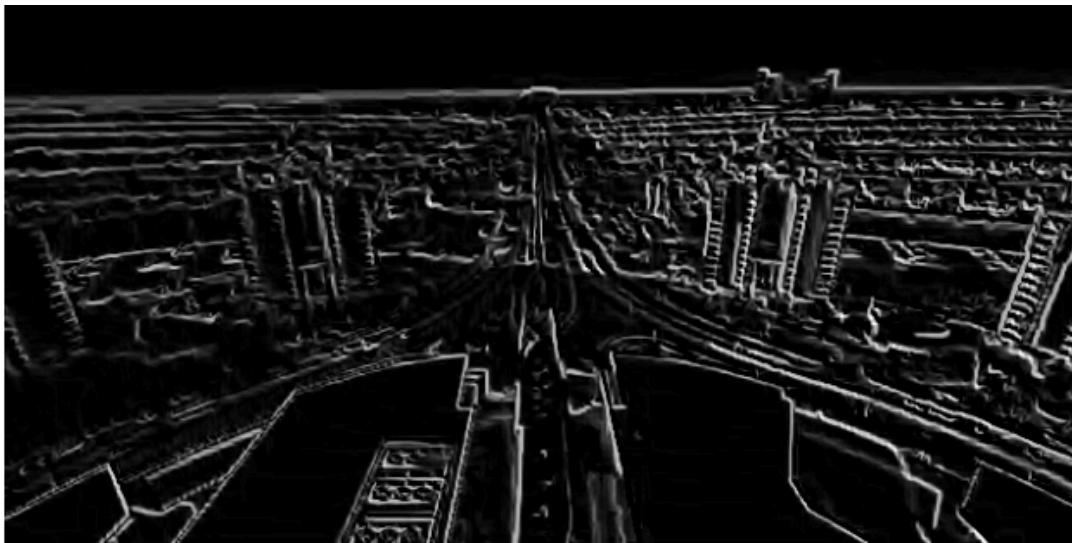
Sobel Edge Detection: 157



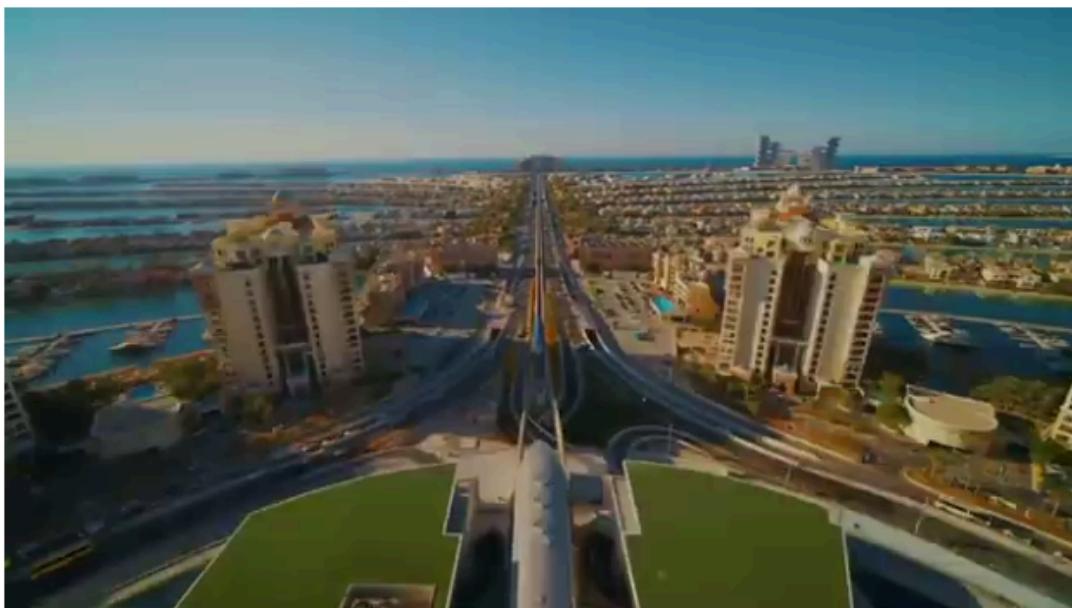
Scene Cut Frame: 158



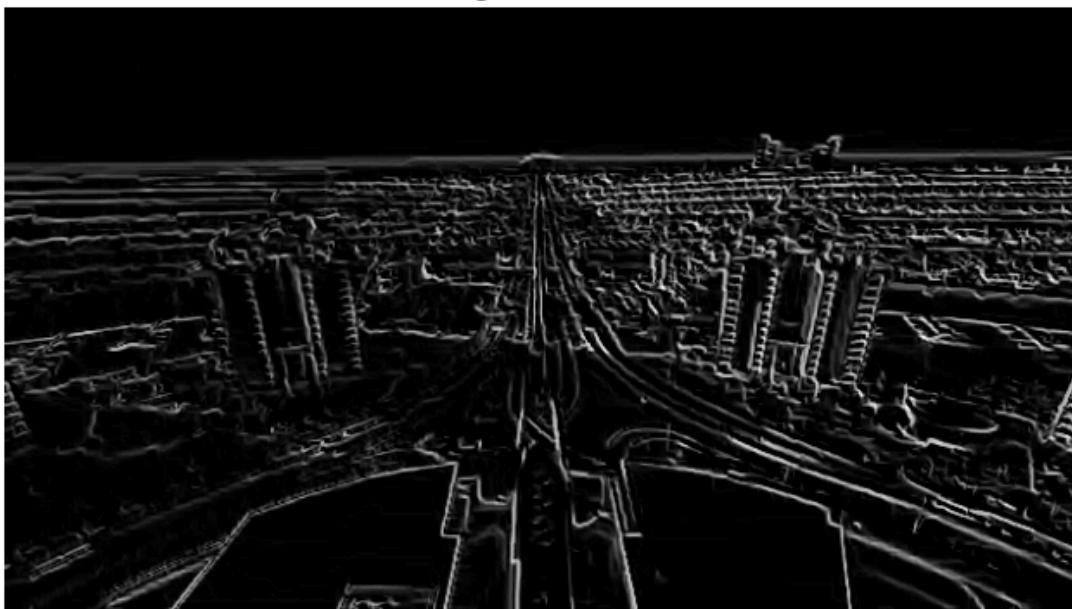
Sobel Edge Detection: 158



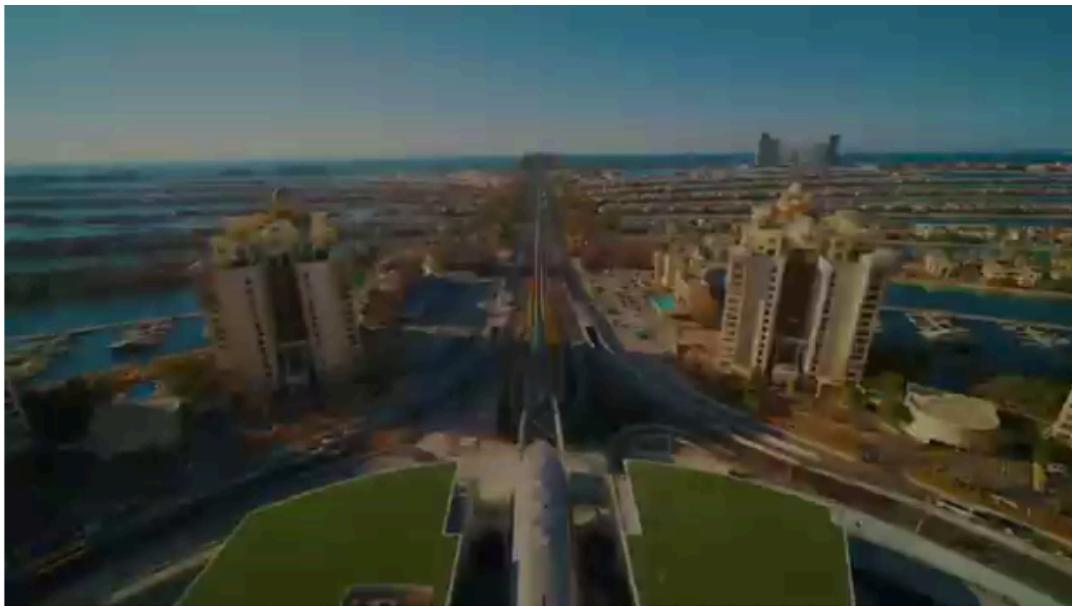
Scene Cut Frame: 197



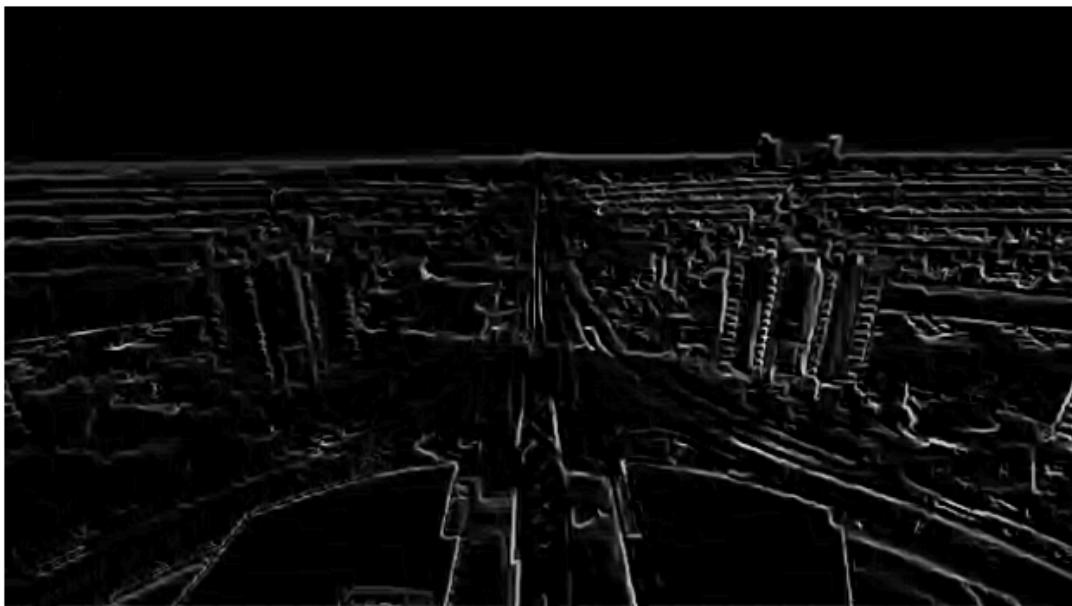
Sobel Edge Detection: 197



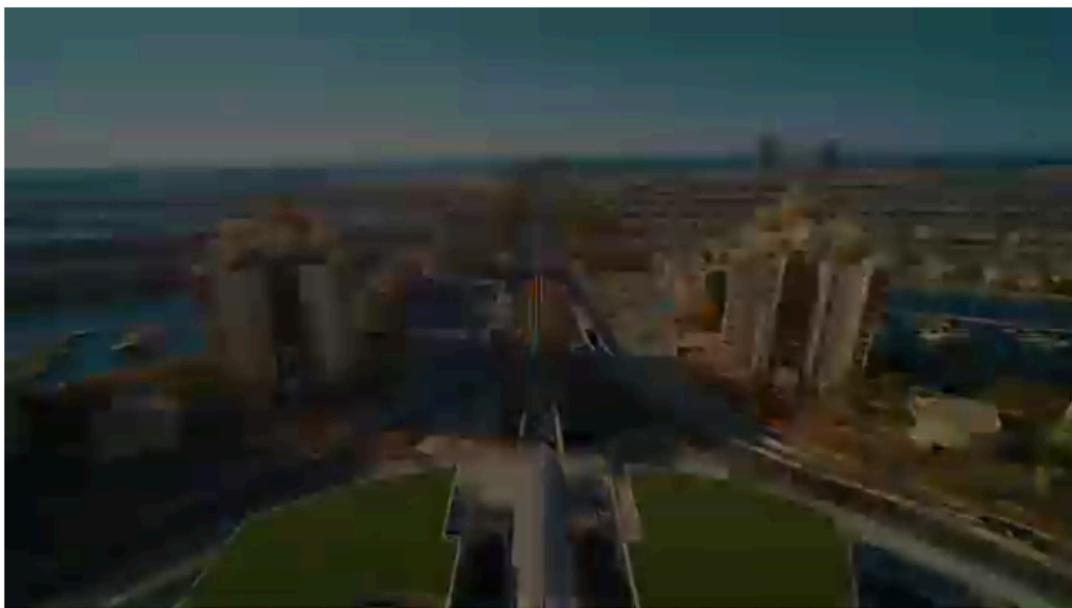
Scene Cut Frame: 198



Sobel Edge Detection: 198



Scene Cut Frame: 199



Sobel Edge Detection: 199**Scene Cut Frame: 200****Sobel Edge Detection: 200**



Scene Cut Frame: 202

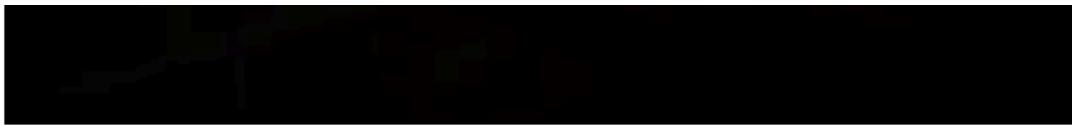


Sobel Edge Detection: 202

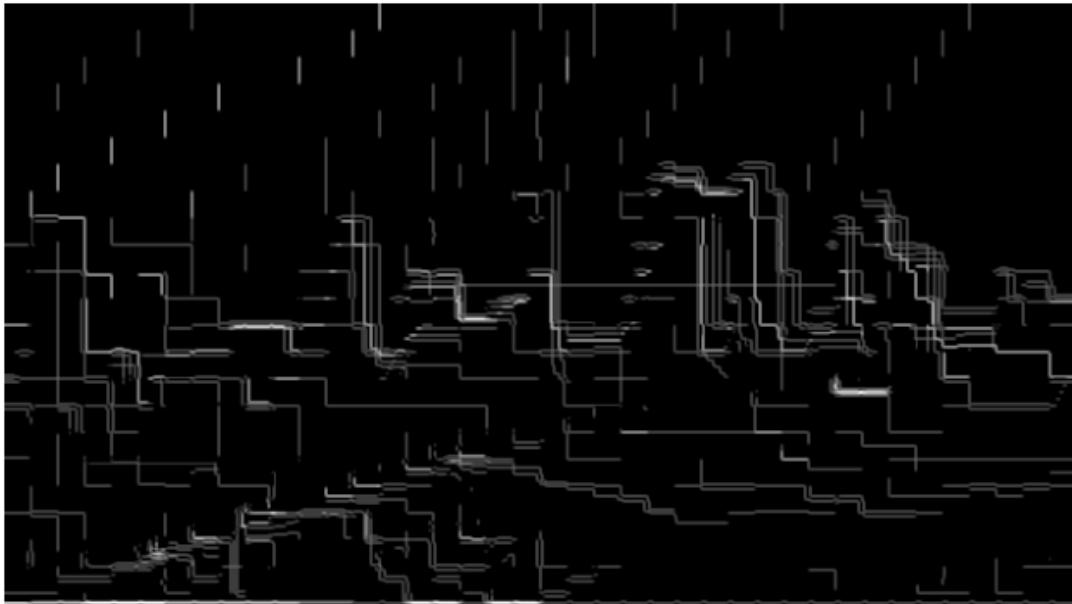


Scene Cut Frame: 203





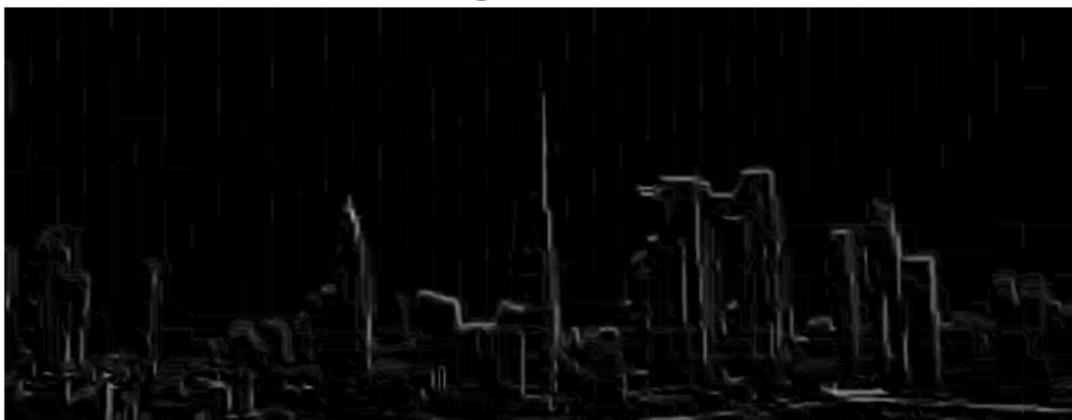
Sobel Edge Detection: 203

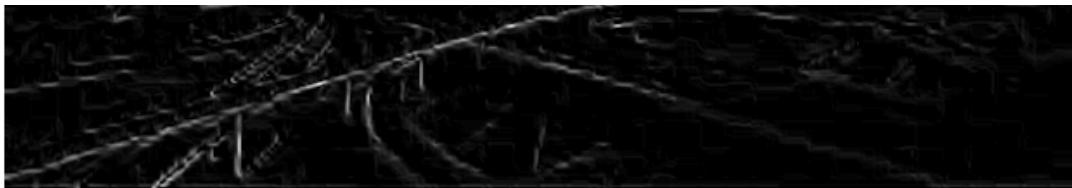


Scene Cut Frame: 204



Sobel Edge Detection: 204

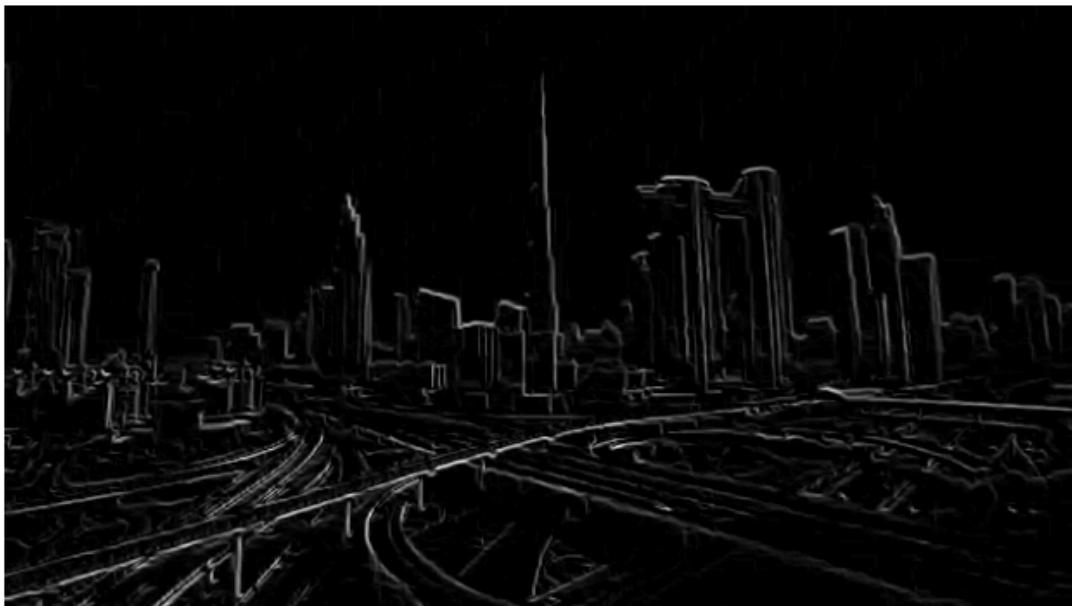




Scene Cut Frame: 205



Sobel Edge Detection: 205

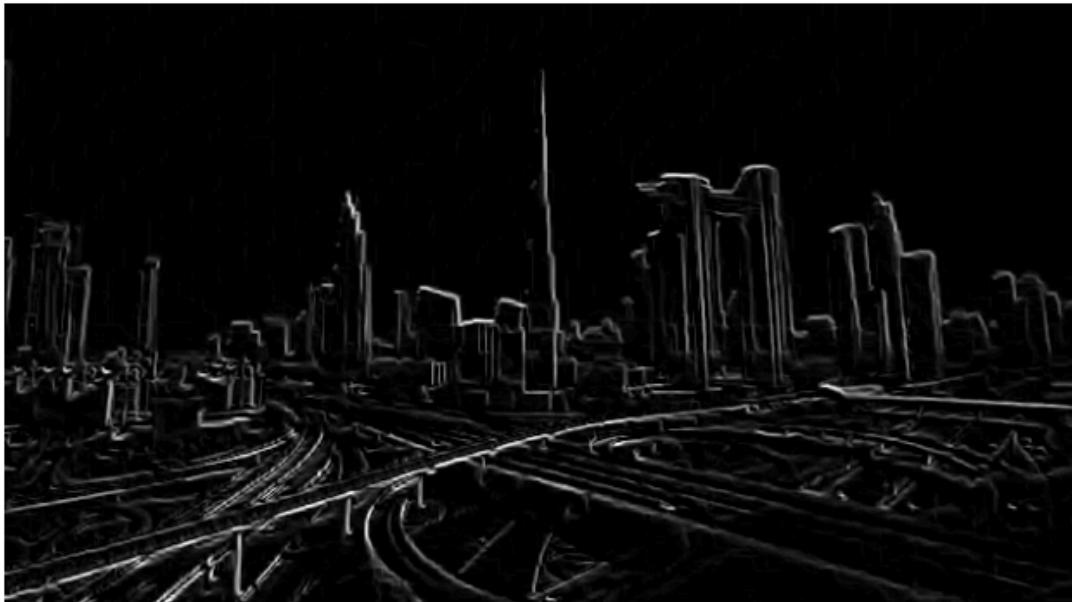


Scene Cut Frame: 206





Sobel Edge Detection: 206



Scene Cut Frame: 208



Sobel Edge Detection: 208

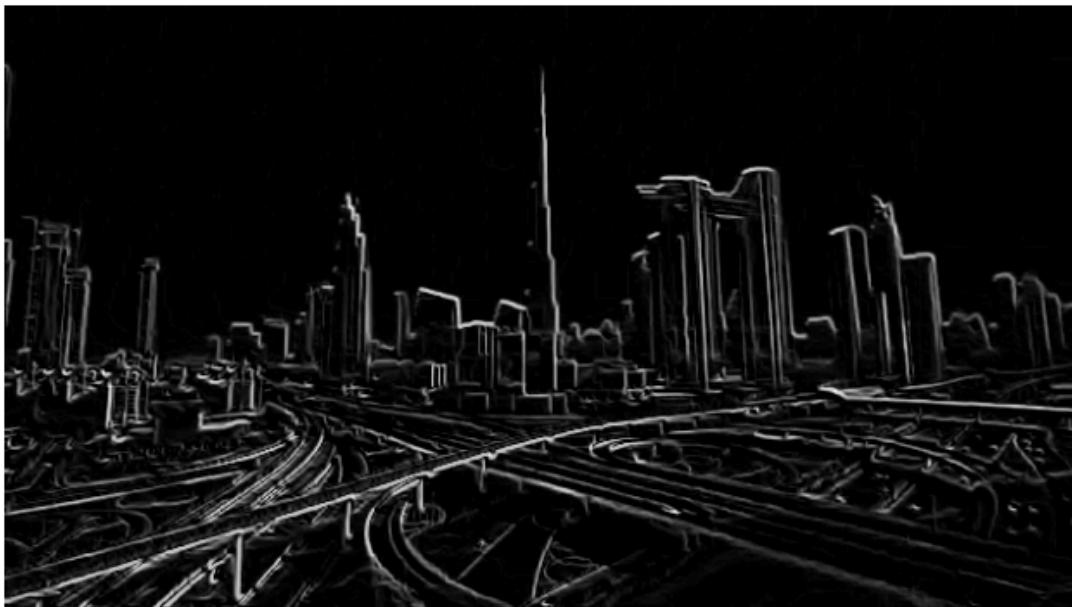




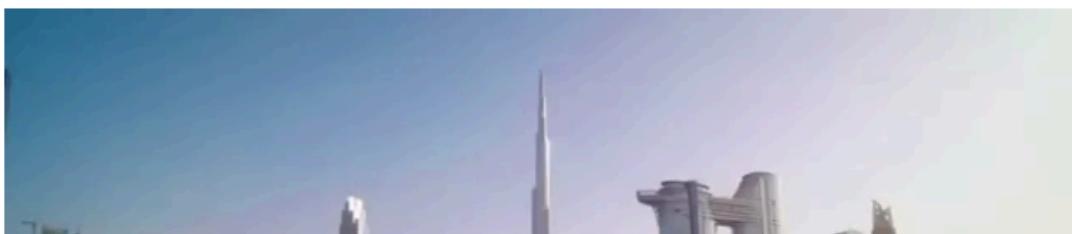
Scene Cut Frame: 209



Sobel Edge Detection: 209

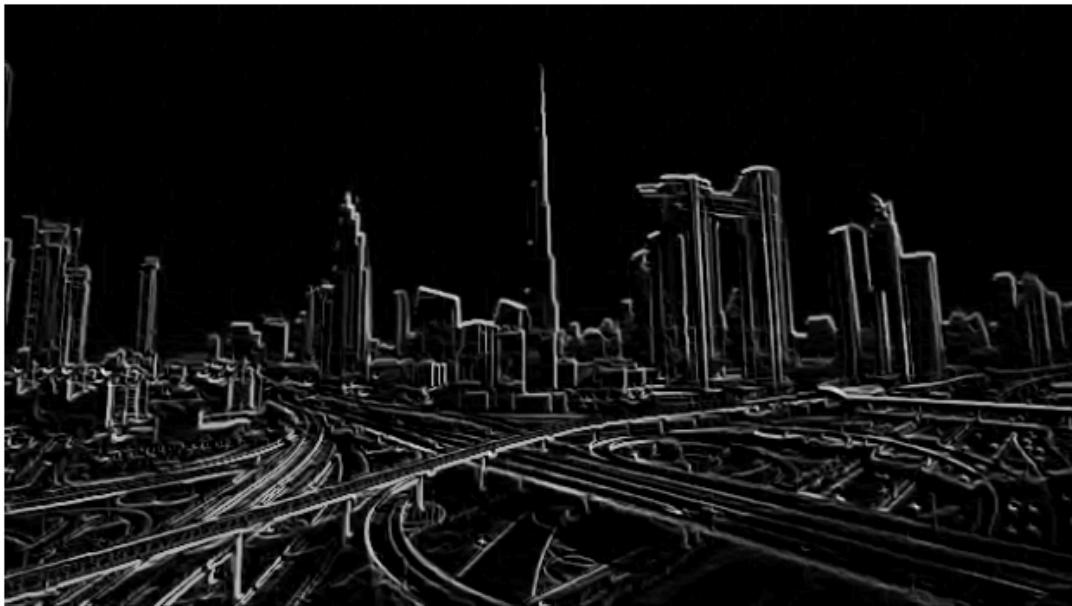


Scene Cut Frame: 210





Sobel Edge Detection: 210



Scene Cut Frame: 251



Sobel Edge Detection: 251

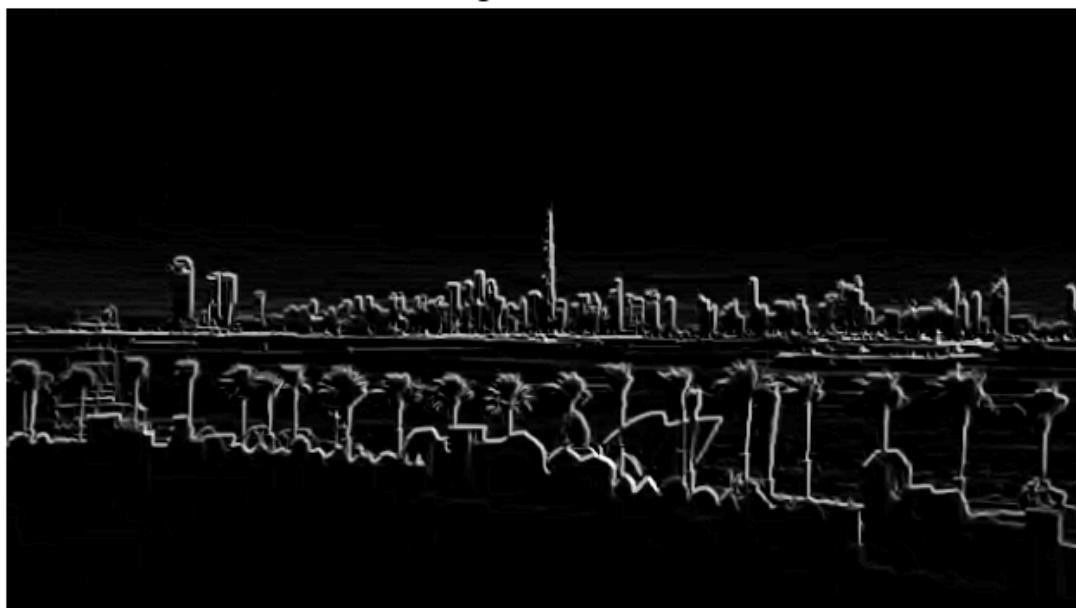




Scene Cut Frame: 276



Sobel Edge Detection: 276

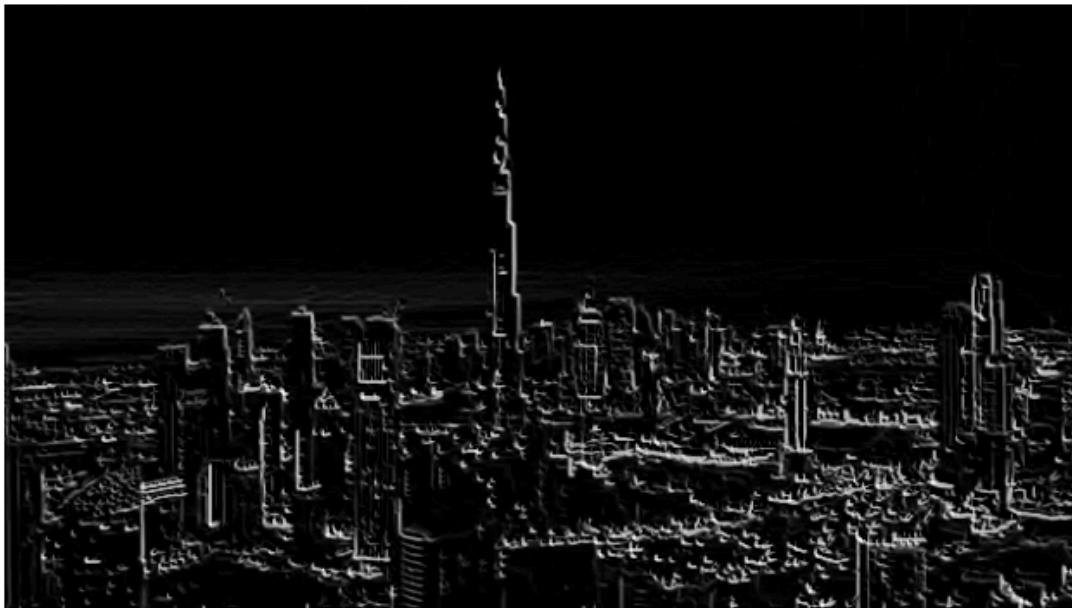


Scene Cut Frame: 299





Sobel Edge Detection: 299



Scene Cut Frame: 311



Sobel Edge Detection: 311



Scene Cut Frame: 335



Sobel Edge Detection: 335



Scene Cut Frame: 345