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SCHOOL OF ENGINEERING

Information Science and Technology

PROJECT REPORT

DEEP LEARNING BASED PROJECT

TOPIC: MOTION DETECTION

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INTRODUCTION

Motion Detection is a process to detect the presence of any moving entity in an area of interest. Motion Detection is of great importance due to its application invarious areas such as surveillance and security, smart homes, and health monitoring.

Today, surveillance cameras are used in all corners of our lives. The role of cameras is not just surveillance. It also helps us to obtain interesting areas andgoals, and helps humans to better complete the expected work. In the field of machine vision, it has a very important role in target detection, recognition, positioning, tracking, and navigation.

In the object detection of human motion, a large number of scholars have studied it, and many methods have been proposed to quickly and accurately find people in video images. However, due to the increased requirements and various needs, the goal of detecting people alone is not enough. In many scenarios, it is necessary to perform motion recognition on the detected people. Therefore, the real-time and accurate detection of the human body in the video image, and its positioning and motion analysis, have an important role in real life.

At present, human body motion recognition mainly includes methods based on biomechanics, bioelectricity, and computer vision.

The method based on computer vision is to use the camera to obtain the movement information of the human body, and then perform motion recognition and evaluation, such as Xie *et al.* and Liu *et al.* calculate the gait energy based on the contour information of the target in the video figure, and then realize motion recognition. The

method based on computer vision is simple in equipment and convenient to deploy. It is the main method of motion recognition and evaluation atthis stage. It is mainly divided into top-down and bottom-up detection methods.

The top-down detection method is to directly use the existing detector to estimate a single person's pose for each person in the image. The detection time is directly proportional to the number of detections. As the target human body in the image increases, the detection time of each image also increases, and the bottom-upmethod can separate the target human body in the complex image

WORKING PRINCIPLE

The motion detection algorithm used by most cameras is very simple. It works by counting the number of pixels which change from one scene to another and if the number exceeds a set threshold it will trigger a positive result.

The downside of using such a simple method is that images can differ naturally throughout the course of a day due to factors such as varying lighting conditions, JPEG artifacts/image noise, movement from plants/trees etc. All of these factors can contribute to false alarm activity by the camera.

Luckily most cameras come with tools to help you adjust the sensitivity of motion detection. At their simplest they allow you to adjust threshold settings so that the speed or size of a moving target can be adjusted. Other tools allow the masking of areas from calculation, multi-window VMD gives a number of unique windows in which to base activity calculations or high-end intelligent video analytics found in DEPA supported Sony cameras provide far better motion detection algorithms which use many more reference frames in the calculation to reduce false alerts.

CODE

```
# Use case Motion Detector

import cv2, time, pandas

from datetime import datetime


first_frame = None

status_list = [None, None]

times = []

df = pandas.DataFrame(columns=["Start", "End"])


video = cv2.VideoCapture(0)


while True:

    check, frame = video.read()

    status = 0
```

```
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    gray = cv2.GaussianBlur(gray, (21, 21), 0)


    if first_frame is None:

        first_frame = gray

        continue


    delta_frame = cv2.absdiff(first_frame, gray)

    thresh_frame = cv2.threshold(delta_frame, 30, 255,
cv2.THRESH_BINARY)[1]

    thresh_frame = cv2.dilate(thresh_frame, None, iterations=2)


    (cnts, _) = cv2.findContours(thresh_frame.copy(),
cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE)


    for contour in cnts:

        if cv2.contourArea(contour) < 10000:

            continue

        status = 1
```

```
    (x, y, w, h) = cv2.boundingRect(contour)
    cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 3)
status_list.append(status)

status_list = status_list[-2:]

if status_list[-1] == 1 and status_list[-2] == 0:
    times.append(datetime.now())
if status_list[-1] == 0 and status_list[-2] == 1:
    times.append(datetime.now())

cv2.imshow("Gray Frame", gray)
cv2.imshow("Delta Frame", delta_frame)
cv2.imshow("Threshold Frame", thresh_frame)
cv2.imshow("Color Frame", frame)

key = cv2.waitKey(1)
```

```
    if key == ord('q'):
        if status == 1:
            times.append(datetime.now())
        break


print(status_list)
print(times)


for i in range(0, len(times), 2):
    df = df.append({"Start": times[i], "End": times[i + 1]},
ignore_index=True)


df.to_csv("Times.csv")


video.release()
cv2.destroyAllWindows()
```

CONCLUSION

With the development of science and technology, human body moving object detection methods based on deep learning have made great progress. The deep convolutional neural network trained based on massive data can extract more effective and robust feature information of the target, which greatly improves the accuracy of human motion detection and positioning and motion recognition.

Therefore, the performance of deep learning-based detection and recognition networks depends to a large extent on the network's ability to learn and predicttarget features.

Deep learning for computer vision is an extremely promising research area that allows to solve a wide range of real-world problems and simplify various processes in healthcare, sports, transportation, retail, manufacturing, etc.

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THANK YOU