Video Streaming and Tracking

Homework 3 – Tracking

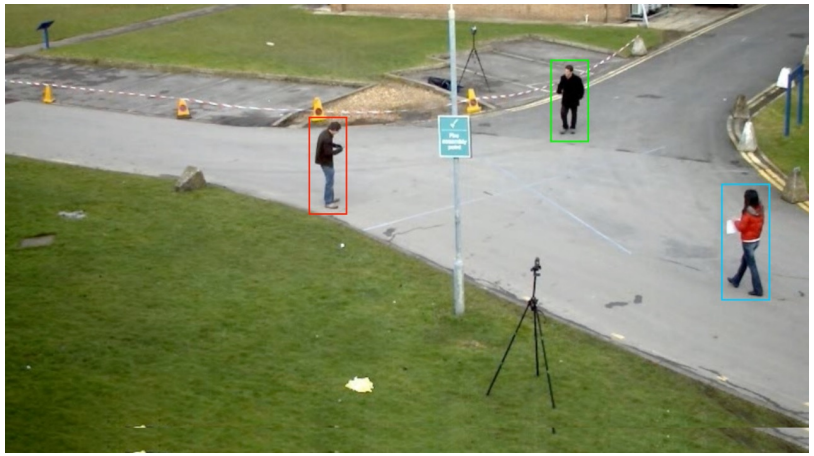
Deadline: 2023/12/10 23:59

Objective

- Implement visual multiple object tracking on videos.
- Using detection model + Hungarian algorithm.
- Calculate the total number of people appearing in the video.
- Output the tracking result video and the count result.

Frame 1

Frame 2



Frame 3

Count: 3

Steps

- Choose a **detection model** and do detection for each frame.
  - You can use pre-trained weights or train by yourself.
  - It is only necessary to detect the 'human' category.
- Use the **Hungarian algorithm** to match the bounding boxes of the current frame with those of the previous frame to achieve the tracking effect.
  - Different object's bounding boxes should be colored with different colors.
  - Decide on the cost factor for the Hungarian algorithm by yourself. (For example, IOU, distance, size difference, ReID similarity, etc.)
  - If same person leaves and re-enters the frame, they should be counted as a different individual.
- Calculate the total number of people in the video.
  - Output the count result in the terminal. (For example, ‘count: 5’).
- Save the video with the tracking results (including the drawn box on the screen).

Benchmark

- The compressed assignment file provides the following data:
  - **'easy_9.mp4'**: A video with a simple scene (no overlapping), used to check if tracking is successfully implemented.
  - **'hard_9.mp4'**: A complex scene (with overlapping), used to evaluate the handling of intersecting bounding boxes.
  - The number after the underscore in the filename represents the correct answer.
  - You can also test with other videos of your choice.
- You don't need to save your output to a text file, just display it directly in the terminal.
- However, you must save the video with the tracking results, including the bounding boxes drawn on the screen.

Grading policy (1/2)

- **Online DEMO**
  - We will have DEMO in 12/11 & 12/14 & 12/15 via Google Meet.
  - The procedure requires you to share your screen and turn on your microphone. Please ensure that these functions are working properly.
  - Please go to Google sheet and fill demo time you prefer. (it will be open at 11/20 12:10)
  - The meeting link and detailed procedures will be announced a few days before demo.

Grading policy (2/2)

- **Model implementation -- 50 points**
  - Show the result video of tracking ‘easy_9.mp4’.
  - Different objects must be tracked with boxes of different colors.
  - Incomplete tracking may result in the deduction of some points.
  - If a tracking model is used instead of a detection model + Hungarian. → -20 points
- **Counting accuracy : Easy case -- 10 points**
  - The counting result of 'easy_9.mp4' must be equal to the answer.
- **Counting accuracy : Hard case -- 20 points**
  - During the DEMO, you will get a video 'demo.mp4' which features a similar scene.
  - Run the video, display the count on the terminal.
  - The closer your answer is to the correct answer, the more points you can earn.
    - For example: ±3 → 20 points, ±6 → 15 points, ±9 → 10 points, and so on.
- **Q&A -- 20 points**
  - TA will ask some questions about your implementation.

Hand in Rules

- Your submission should contain:
    1. **Code** (DO NOT contain any model weights or videos)

- Compress into one zip file name **HW3_[studentID].zip**

Penalty

- Format penalty : 10 points
  - Submit in wrong name, format, etc.
- Late penalty : 20% per day
  - 1 day → 80%, 2days → 60%, and so on.
- You can use any code from Github, but **DO NOT** copy from your classmate!
  - Any copying will result in a score of zero.

References

- https://zh.wikipedia.org/zh-tw/匈牙利算法
- https://hackmd.io/@computerVision/S18nD20Vq
- https://alu2019.home.blog/2021/01/20/edge-ai-multiple-object-tracking-mot-duo-ge-wu-ti/
- https://blog.csdn.net/your_answer/article/details/79160045