

Player and Ball Tracking with CSV Export

Overview

This project implements a system to track players and the ball in a sports video using a YOLOv11 model. The system assigns each player a unique ID while they are visible in the frame and logs their positions to a CSV file for further analysis.

Workflow Summary

- Detection:**
Each video frame is processed with a YOLOv11 model to detect players and the ball.
- Feature Extraction:**
For every detected player, the system extracts appearance features (color histogram) and spatial features (bounding box center).
- ID Assignment:**
Players are matched to existing IDs using a combination of appearance and position similarity, optimized with the Hungarian algorithm. New IDs are assigned to unmatched detections.
- CSV Logging:**
Each player's ID and position (frame number, x_center, y_center) are logged to a CSV file using a dedicated logger class.
- Visualization:**
The system draws bounding boxes and IDs for players, and labels the ball, saving the annotated video.

Code Structure

- **csv_utils.py:**
Contains the `PlayerCSVLogger` class for writing player positions to a CSV file.
- **main_tracking.py / Notebook:**
 - Imports the logger.
 - Loads the YOLOv11 model and video.

- Processes each frame: detects, extracts features, assigns IDs, visualizes, and logs to CSV.

CSV Output Example

frame	player_id	x_center	y_center
0	0	320	120
0	1	540	200
1	0	322	121
...

How to Use

1. Place `csv_utils.py` and your main script/notebook in the same directory.
2. Run the main code.
 - The output video will be saved as `output_tracking.mp4`.
 - Player positions will be logged in `player_positions.csv`.

Key Parameters

- **appearance_weight**: Importance of appearance in matching (default: 0.7)
- **position_weight**: Importance of position in matching (default: 0.3)
- **similarity_threshold**: Minimum similarity for ID assignment (default: 0.65)

Conclusion

This solution provides reliable, frame-by-frame tracking of players and the ball, with player positions exported for easy analysis. The modular CSV logger makes data export simple and reusable.