Ahmedabad University

CSE 541 - Computer Vision

Weekly Report 05_03_2023

Team: - Pixel Pioneers

Group Member Details

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Tasks Performed in the week

- We learned about the Kalman filter which is used to estimate the true state of the object over a time. In the context of object detection, the Kalman filter can be used to track the position, velocity, and acceleration of an object over time based on noisy measurements from sensors such as cameras or lidars.
- We coded and implemented the Kalman filter to predict the position of the object (which we are tracking) when there is an occlusion, such as a wall, fog, or any other medium which could result in a disturbance to the camera feed.
- In other words when the feed from the camera is not available then 100% of the Kalman feed will be used and when the camera feed is available then 100% of the camera data will be used.
- When there is no occlusion the linear motion data will be updated for the Kalman filter in order so that whenever occlusion occurs, it can predict the most accurate position of the object.

Outcomes of the Tasks Performed

- We implemented Kalman filter in Python, here is the description of implementation
    - We implemented a Kalman filter for both 1D and 2D object tracking.
    - In 2D implementation, state transition matrix A and control matrix are calculated which are indicating the velocity and the direction of the object in x and y directions at particular time.
    - After that we calculated transformation matrix H, which is a particular case where we are not considering the velocity of the object.
    - Process noise covariance matrix Q and measurement noise covariance matrix R is calculated for prediction of the position of the object.
    - In 1D implementation we follow the process is the same as 2D implementation, but here we are only calculating the velocity and direction in x direction only, we are not calculating the for y direction.
- Link for code is:

https://colab.research.google.com/drive/14A6Fk8uBg67Qsk8NyROUFIIInQd0T7pS?usp=sharing

- Code reference:
  https://www.mathworks.com/help/vision/ug/using-kalman-filter-for-object-tracking.html
  https://machinelearningspace.com/object-tracking-python/
  https://machinelearningspace.com/2d-object-tracking-using-kalman-filter/

Tasks to be performed in the upcoming week.

- Training YOLOv4 with the BDD100K dataset.
- To correct the error of the code and run the Kalman filter on a live video in order to predict the position of an object.