

Sensor fusion is the ability to use sensors measurement to accurately track the object and know its position and velocity as a prediction in a certain time while minimising the error by adding the values of the real measurements to the estimated ones.

The first step in sensor fusion is filtering. The goal of filtering is to estimate the state of an object at each time step, given its past state and measurements from multiple sensors. The most commonly used filtering technique in sensor fusion is the Kalman filter, which is a mathematical algorithm that uses a series of measurements and predictions to estimate the position and velocity of an object. The Kalman filter is useful to suppress noise in the environment where measurements are prone to errors.

The second step is track management. This aim to maintain a set of tracks, each corresponding to a certain object, and to update these tracks as new measurements are captured from multiple sensors. This involves track initialization, track termination, and track maintenance.

The third step is association. The aim of this is to connect measurements from multiple sensors with existing tracks. Association involves matching measurements to tracks based on their location, size, and other attributes.

The silliest part of the project is converting the matrix from 2d to 3d and dealing with numpy arrays. The equations part where the best part.

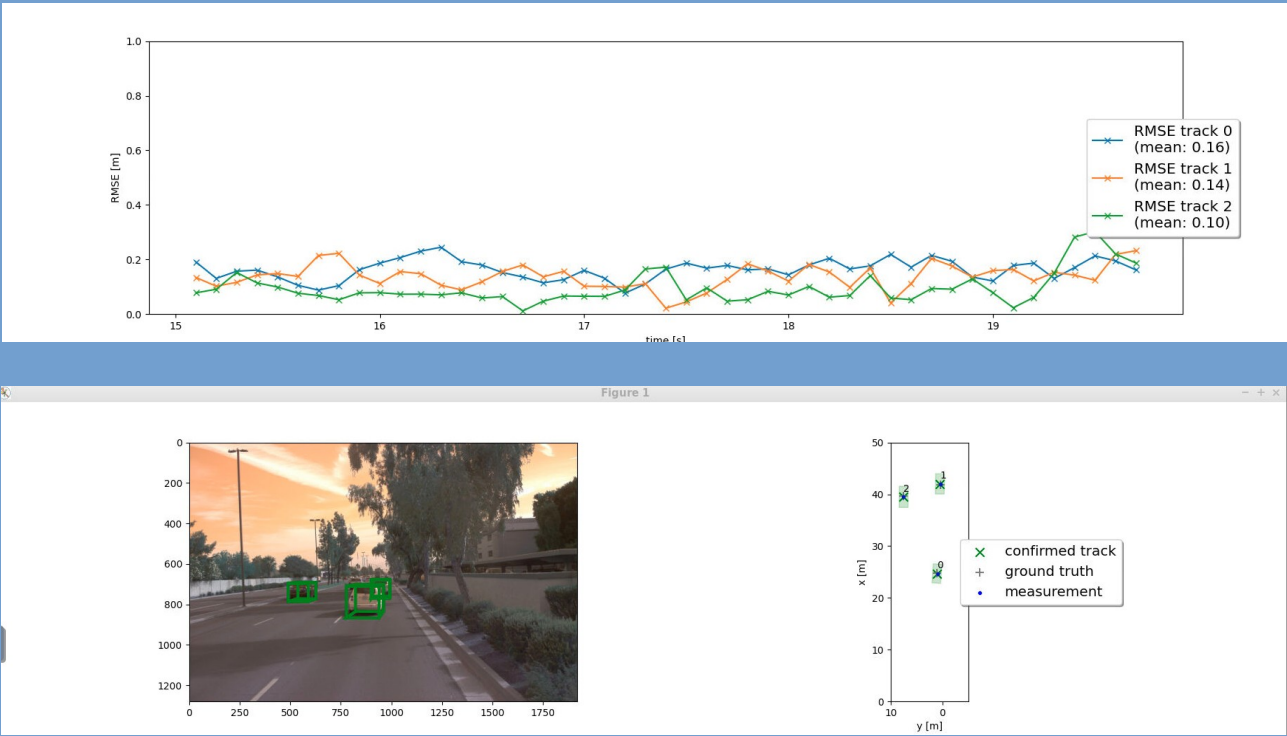
In my opinion camera and lidar complete each other in terms of that camera has a better measurements without noise and better with object detection. Lidar on the other hand is better at measuring distance and acting as an active sensor that works better at night. They both necessary to complement each other.

I think some problems that may encounter that system are the environment where the fog for example affects both the camera and the lidar measurements. Also it is very expensive ti use those systems but lidar development may enhance this in the near future.

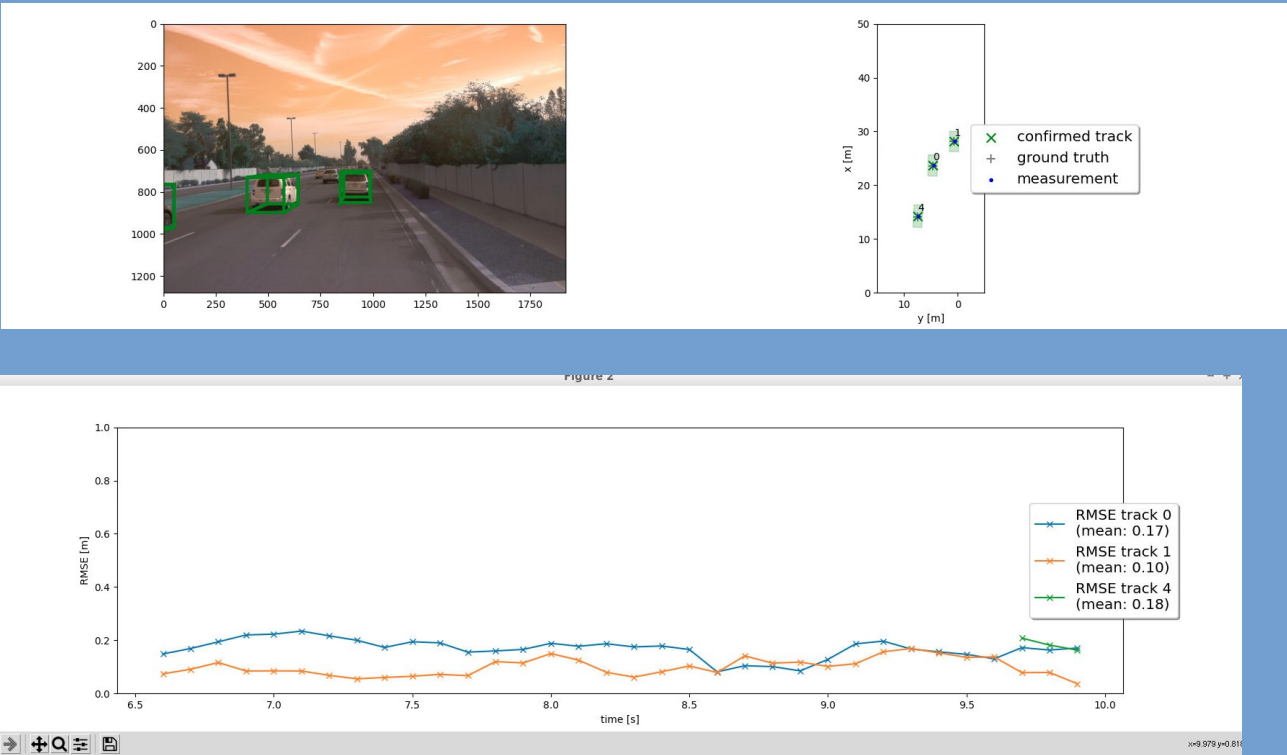
I think in the future we shall gather more data in different environment to train AI model with better data to get better results. Also the development of the sensors will make this process more promising.

Results:

step 1



step 2



final Results

