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Closer to Where It Wasn't: Estimation and Tracking Using Adaptive Filtering

I used a computer modeling and simulation approach to build and test two adaptive filters (a Recursive Least-Squares (RLS) Filter, and a Kalman Filter) as well as a non-adaptive Three-dimensional g-h Filter. My computer model produced a target for the filters to track. The target had either constant acceleration or varying acceleration trajectories. My filters applied position measurements to estimate the target motion. Using the current target motion estimate, the filters created a prediction for the next target position. Then, I took a position measurement (with measurement error). The filters used only position measurements to update estimates in the target position, velocity and acceleration. The cycle repeated, using incrementally less of the measurement in each update (adaptive), leading to an accurate representation for the target path. Both of my adaptive filters improved up on my non-adaptive design by including acceleration in the target model. At a set time, I calculated an extended batch prediction of the target future position. I tuned my batch predictor my experimenting with the number of measurements I used. I completed the testing process for my RLS Filter with different amounts of error, and different trajectories. I tested my Kalman Filter by experimenting with different process noise levels. My Kalman Filter performed best because it could keep up with acceleration changes. Simulations experimentally determined the best performing filter.