Optimal Sampling of Sensor Data for Kalman Filtering

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Abstract : we consider the question of optimal sampling of sensor data for Kalman filtering. The basic problem is to design a linear filter whose output provides an unbiased minimum variance estimate of a signal process whose noisy measurements from multiple sensors are available for input to the filter. The problem is to assign weights to each of the sources (sensor data) dynamically so as to minimize estimation errors. We formulate the problem as an optimal control problem where the weight given to each of the sensor data is considered as one of the control variables satisfying certain constraints. There are as many controls as there are sensors. Using the control parameterization enhancing transform technique (CPET), we develop an efficient method for determining the optimal sampling strategy. Some numerical results are presented for illustration.