Gathering measurement information is increasingly done over data networks, causing delay, packet overtaking or even loss of measurement data. In particular the use of low cost measurement systems, producing event driven measurements, can result in additional phenomena like asynchronous measurements and unknown time of measurement.

This contribution introduces a Gauss-Newton Moving Horizon State Estimator for the state estimation of nonlinear continuous-time dynamical systems with measurement over data network.

The idea is to estimate the state vector by using only a fixed number of the latest measurements, which is known as the so called moving horizon. The main advantages of this method are the reduction of the numerical costs without significantly losing estimator’s performance and the possibility of immediate integration of the new measurements. The cost function that should be minimized can be designed considering different types of errors, and even unknown system parameters can be involved into the optimization procedure. This optimization problem can be reformulated into a root-finding problem that is solved by the Gauss-Newton iteration. Each step of this iteration requires the solution of a matrix valued initial value problem. [1-4] give introductions into the field that has been very active in the 90s. In [5], some more recent results, including parameter estimation, have been presented.

For the purpose of state estimation over networks, the existing results are to be extended, in order to handle the following phenomena: (1) asynchronous (event driven) measurements, measurement loss and overtaking; (2) loss of absolute time stamps on measurements, (3) moving measurement devices. In addition, the estimation (over network) of system parameters and of the input signals to the system are investigated.


