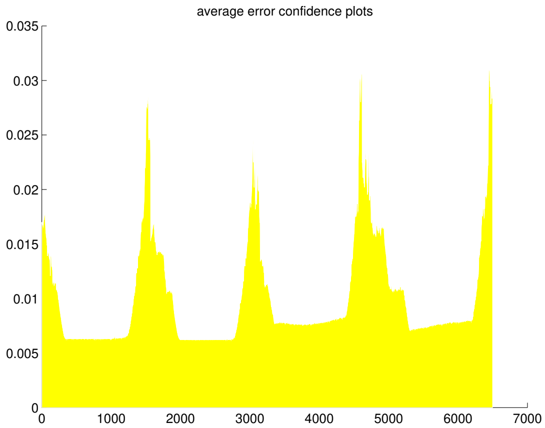
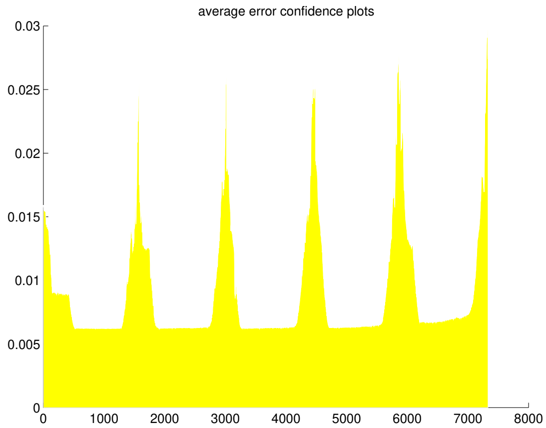
6.3.5 Analysing the local confidence limits

By examining the local error statistics (as defined in Section 3.2.1) for the local models the location of the worst errors can be deduced, possibly helping the engineer learn where the complexity in the real process is, or where insufficient experimental data exists. The test run is plotted below, where the error is shown, with the network's estimation of its own accuracy.



(a) Error statistics and LMN's weighted average error prediction on the training set used to derive the estimates.

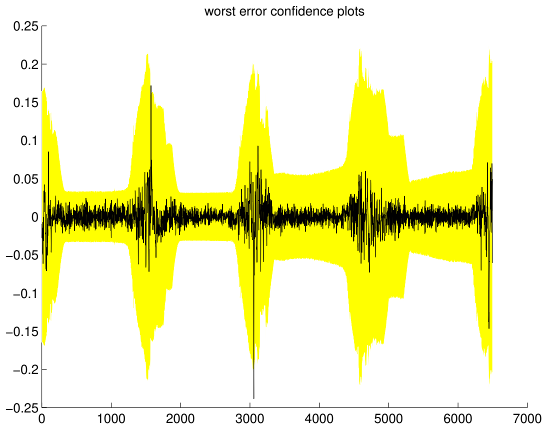


(b) Error statistics and LMN's weighted average error prediction on the validation set.

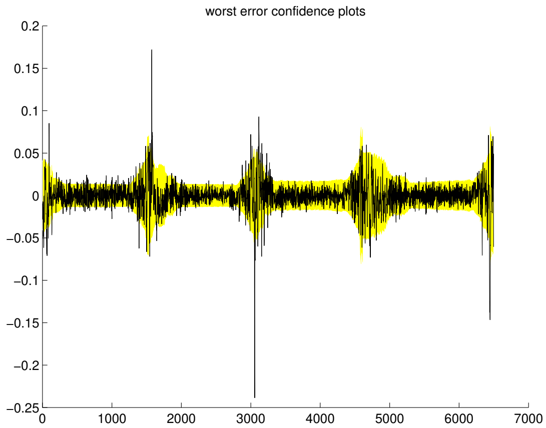
Figure 6.25: State-dependent average error statistics on the training and validation data

What happens when we close the loop?

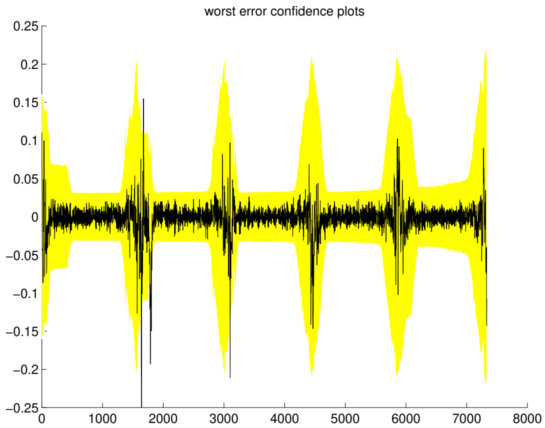
Despite the validation process, the real test of the model will only happen when it is used as it was intended in the real system. In this case, any false assumptions about the system, or disturbances on the training data will become immediately apparent. Once a controller is built which uses the model from the learning phase, it may also make the old model invalid. This is because the new, improved controller will impose a different type of stimulation on the process, which will cover different areas of the input space, and which may produce quite different responses from the process.



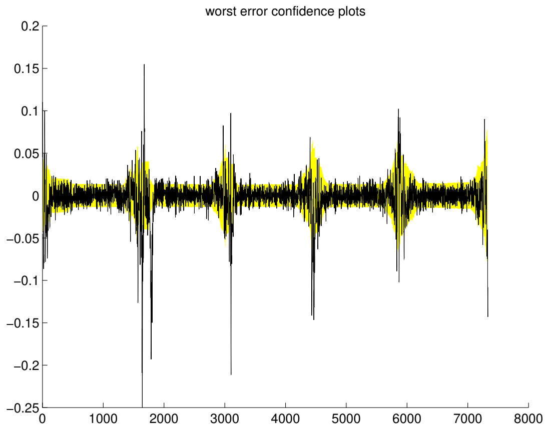
(a) Model residuals and LMN's local worst error prediction on the training set used to derive the estimates. The worst error from the local model's receptive field is taken (where basis function > 0.1), so the algorithm tends to overestimate the worst error.



(b) Model residuals and LMN's weighted worst error prediction on the training set used to derive the estimates. Because the worst error is weighted the algorithm tends to underestimate the maximum error



(c) Model residuals and LMN's local worst error prediction on the validation set.



(d) Model residuals and LMN's weighted worst error prediction on the validation set.

Figure 6.26: State-dependent worst error statistics on the training and validation data.