On the ill-posedness of observation problems

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Abstract. We call observation problems the estimation of state variables (or more generally, internal variables) from two sources of information: online measurements of some variables and the dynamic model relating the quantities to be estimated and the measurements. In the control theory engineering literature the tremendous success of the Kalman filter has left little room to numerical analysis approaches to observation problems. This work is a contribution to the building of a tunnel between numerical analysis and engineering literature on observation problems. The first brick is seen to be the statement that state estimation is an ill-posed inverse problem. This is the aim of the present communication. More precisely, we restrict ourselves to linear systems (not necessarily with constant coefficients).
Keywords. Observer design; State estimation; Ill-posed inverse problems

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