

An Unifying View of Some Process Adjustment Methods

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Abstract

Consider the problem of adjusting a machine that starts production after a defective setup operation. This setup adjustment problem was first studied by Grubbs (1954, 1983). A general formulation for setup adjustment problems is presented in this paper. The formulation unifies some well-known process adjustment schemes, including Grubb's harmonic and extended rules, adjustment methods based on stochastic approximation and recursive least squares, and a recent method on adaptive EWMA feedback controllers. The proposed formulation is based on a simple State-Space model and a Kalman Filter. This formulation allows to show that equivalence of the setup process adjustment problem with a simple instance of what in the control engineering literature is called a linear quadratic gaussian (LQG) controller. As an important byproduct, the LQG model allows to solve more complicated setup adjustment problems with readily available techniques. Extensions to cases when there are quadratic adjustment costs and when the problem is multivariate are discussed. The multivariate setup adjustment solution is illustrated with a multihead filling machine example.