ID4
AR Identification

4.3 PARAMETER ESTIMATION

AR models are mainly used, like ARX ones, for prediction and control and thus the cost function usually adopted consists in minimizing prediction error (3.3.2). The parameter estimate can be obtained by means of expression (3.3.9) or, equivalently, of the least squares formula (3.3.12); all that is needed is redefining the parameter vector θ and matrix H as follows

$$\theta = \left[\alpha_1 \; \alpha_2 \ldots \alpha_{n-1} \; \alpha_n \right]^T \tag{4.3.1}$$

$$H = H_n(y). \tag{4.3.2}$$

The least squares estimate is, on the basis of what has been proved for ARX models, unbiased and characterized by a covariance matrix given by expressions (3.8.4) and (3.8.6). It is also possible to implement recursive identification schemes based on (3.6.10), updating the gain matrix $K(t)$ by means of (3.6.16), and to use weighted least squares or Kalman filtering; the only trivial variations that are required consist in canceling the β_i coefficients in the parameter vectors and input samples from all vectors and matrices. The estimate of the noise variance can be performed using (3.10.5) and (3.14.16).