

ABSTRACT

Offline optimization of controller parameters for complex non-linear processes can be time consuming, even with high performance computers. This chapter demonstrates how a Radial Basis Function ANN can be utilized to tune the controller parameters for a non-linear process quickly. The ANN strategy used is basically to approximate the relationship between the controller parameters and the values of the objective function used. This strategy is called metamodeling or surrogate modeling (Gorissen et. al., 2006). The process used in this chapter is the mixing process, which is a multivariable and intrinsically non-linear plant. The Radial Basis Function Neural Network surrogate model used was able to give a good approximation to the optimum controller parameters in this case. In the design of control systems, one often has a complicated mathematical model of a system that has been obtained from fundamental physics and chemistry. The system will usually consist of inputs and outputs and in practice; it is normally desired to find the optimum controller parameter values that would give optimal outputs of the system. The simulations needed when applying optimization algorithms might be very expensive computationally owing to the complexity of the actual model. In spite of the advances in computer technology, the computational time to simulate the actual model might still be long and thus it becomes impractical to rely exclusively on simulation for the purpose of design optimization. Thus there is a need for metamodeling, that is, for the determination of simpler models that involve less computation but are good approximations to the complicated model.