

UTILIZATION OF HISTORIC INFORMATION IN AN OPTIMISATION TASK*

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One of the basic components of a discrete model of motor behaviour and decision making, which describes tracking and supervisory control in unitary terms, we assume to be a filtering mechanism which is tied to the representational principles of human memory for time-series information.

Optimisation of tracking performance, tuning of a system in supervisory control, fault detection under certain conditions, all require the estimation of statistical parameters of time-series data (mean, variance, spectrum), as also assumed in the Optimal Control Model or the Crossover Model. Little empirical evidence is available about the representational principles for time-series information, although generally it is assumed that humans are capable of estimating variances (e.g. in Signal-Detection and Decision Theory).

We use a task where a window of constant length of a time-series, time-course and momentary values of two cost-variables are displayed. The subjects task is to optimize total payoff by adjusting one parameter, the optimal value of which is dependent upon the distribution of the time-series.

In a series of experiments subjects used the time-series information with certain significant limitations: There is a range-effect; asymmetric distributions seem to be recognized, but it does not seem to be possible to optimize performance based on skewed distributions. Thus there is a transformation of the displayed data between the perceptual system and representation in memory involving a loss of information. This rules out a number of representational principles for time-series information in memory and fits very well into the framework of a comprehensive discrete model for control of complex systems, modelling continuous control (tracking), discrete responses, supervisory behaviour and learning.