SYNOPSIS of paper to be submitted to the Conference on

"Advances in Automatic Control"

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NONLINEAR SIMPLIFICATIONS OF THE GENERAL CONTROL PROBLEM

The general control problem is stated in an automaton formulation suitable for further analysis. It is shown that classical linear systems theory is one possible simplification of this problem. Sampling systems, bang-bang control, stochastic linear systems and attempts to achieve further generality within the framework of linear systems by adaptive control are briefly reviewed.

It is proposed that in the assumptions which simplify the general control problem there should be distinguished those features which are tenable through the nature of our choice of what to control, and those features which give computational convenience when a controller is to be synthesized. Linearization has both types of feature for it is mainly the local topological and metric properties of linear spaces which reflect our practical choice of the real world to control, whilst the extension of local to global which is the essence of linearity mainly gives convenience in storage and computation.

Simplifications of the general control problem by other means than immediate linearization are discussed and adaption to demand, identification, stochastic and drifting systems, together with the storage and computational problems of controllers working directly with the automaton formulation are ~~xx~~ analysed.

To demonstrate the techniques of synthesis which arise from these alternative simplifications an example is given of a controller which works directly with the automaton formulation of its plant or environment, identifying both environment and demand, stochastic or determinate. This controller, named STeLLA, has been extensively studied by computer simulation on control problems ranging from the game-playing and maze-running environments of 'artificial intelligence' to a conventional second-order, stochastic linear system with amplitude limiting and transport lag, and examples are given of its behaviour and performance.

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