

The Southwest Mechanics Lecture Series

at

Texas A&M University

THE CONCEPT OF ATTENTION IN THE DESIGN OF CONTROL SYSTEMS FOR ROBOTICS OTHER MOTION CONTROL SYSTEMS

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Abstract

Today, as has been the case for decades, there is tension between the those involved developing the theory of automatic control and those applying it in the market place. This tension is exemplified, on one hand, by the extraordinary hyperbole and over zealous salesmanship associated with various "low tech" approaches to control (think fuzzy washing machines) and, on the other hand, by the unwillingness of most control theorists to modify their "high tech" approaches so as to make them relevant to problems in which saturation, exception handling, and rule based designs are the most effective way to get the job done (think mu synthesis). This non meeting of minds has generated considerable discussion but rather little in the way of new ideas. The purpose of this talk is to describe a point of view on the design of controls which can lead to principled approaches to design, based on methodologies that do not require one to abandon the scientific method or to corrupt the various modes of thought that have served science and engineering so well in the past. We seek to show that there are substantial benefits to be reaped if one includes in the optimization process terms that reflect the cost of implementing the control laws, and that when one does so the resulting control law bears more resemblance to something practical. The appropriate form for the new performance measures, and the nature of the solutions of the optimization problems that they lead to, will be discussed and illustrated. In particular we will consider the idea of including in the performance measure something akin to what psychologists call attention and go on to argue that by reducing the attention required one makes the control law easier and less expensive to implement. There will be some brief video clips illustrating laboratory implementations of these ideas relating to robotics.framework to rationalize and extend existing simplified models of the crack closure process.



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