

<u>Question</u>	<u>Answer</u>
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Title of Paper	Numerical and Graphical Illustrations of Fundamental Concepts in Automatic Control Systems
Abstract	<p>In my teaching of automatic control systems for many years, certain fundamental concepts can be difficult for students to grasp. One concept is the nature and effects, both favorable and unfavorable, of feedback; another concept is how steady-state errors can occur in systems even if one could construct them with perfect components. This paper focuses on such concepts by utilizing numerical and graphical methods, with analogies familiar to the students, to develop conceptual understanding before applying detailed mathematical analyses. The basic equations are presented and applied to enable the instructor to visually present the effects through comparative graphs of the transient responses, such as the illustrative examples included in this paper. If time and interest allows for the students to explore further, they can vary the parameters of the systems and change the inputs to interactively experience the effects first hand as formal homeworks or informal exercises. An added benefit of the illustrations is that the concepts of differentiation and integration first covered in calculus are visually reinforced and enhanced for the students. Survey results indicate that the vast majority of my students find these numerical and graphical illustrations with familiar analogies helpful to learning the fundamentals of automatic control systems.</p>