

## Derivatives Balance Method for Linear and Nonlinear Control Systems

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**Abstract :** work deals with an universal control technique or single controller for linear and nonlinear stabilization and tracing control systems. These systems may be structured as SISO and MIMO. Parameters of controlled plants can vary over a wide range. Introduced a novel control systems design method, construction of stable platform orbits using derivative balance, solved transfer function stability preservation problem of linear system under partial substitution of a rational function. Universal controller is proposed as a polar system with the multiple orbits to simplify design procedure, where each orbit represent single order of controller transfer function. Designed controller consist of proportional, integral, derivative terms and multiple feedback and feedforward loops. The controller parameters synthesis method is presented. In generally, controller parameters depend on new polynomial equation where all parameters have a relationship with each other and have fixed values without requirements of retuning. The simulation results show that the proposed universal controller can stabilize infinity number of linear and nonlinear plants and shaping desired previously ordered performance. It has been proven that sensor errors and poor performance will be completely compensated and cannot affect system performance. Disturbances and noises effect on the controller loop will be fully rejected. Technical and economic effect of using proposed controller has been investigated and compared to adaptive, predictive, and robust controllers. The economic analysis shows the advantage of single controller with fixed parameters to drive infinity numbers of plants compared to above mentioned control techniques.

**Keywords :** derivative balance, fixed parameters, stable platform, universal control

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