

**DESIGN OF A FRACTIONAL CONTROL  
USING PERFORMANCE CONTOURS.  
APPLICATION TO AN ELECTROMECHANICAL SYSTEM**

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**Abstract**

The article uses complex fractional differentiation to design a controller ensuring dynamic behavior of a control system. The proposed method uses two contours called “performance contours” and constructed on the Nichols diagram. The first contour is the common Nichols magnitude contour that can be considered as an iso-overshoot contour. The second contour constructed thanks to complex fractional differentiation is a new contour defined on the Nichols diagram and parameterized by the damping ratio. The design method leads to the computation of a complex fractional order transfer function whose open-loop Nichols locus tangents both performance contours, thus ensuring stability margins and dynamic behavior. The method is applied to a DC motor whose speed is controlled.

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