

# Linear Fractional Order System Identification using Adjustable Fractional Order Differentiator

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**Abstract:** In previous decades, it has been observed that many physical systems are well characterised by fractional order models. Hence, their identification is attracting more and more interest of the scientific community. However, they pose a more difficult identification problem, which requires not only the estimation of model coefficients but also the determination of fractional orders with the tedious calculation of fractional order derivatives. This study focuses on an identification scheme, in the time domain, of dynamic systems described by linear fractional order differential equations. The proposed identification method is based on the recursive least squares algorithm applied to an ARX structure derived from the linear fractional order differential equation using adjustable fractional order differentiators. The basic ideas and the derived formulations of the identification scheme are presented. Illustrative examples are presented to validate the proposed linear fractional order system identification approach.

**Keywords :** Adjustable fractional order differentiator, Least squares method, Linear fractional differential equation, Recursive identification.