

Asymptotic stability of fractional variable order discrete-time equations with terms of convolution operators

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Abstract: Recently, fractional calculus has been considered in many scientific and engineering fields. There two important cases: continuous-time as discrete-time equations. The importance of discrete case can be examined in applications. In the paper we discuss asymptotic stability of linear fractional difference equations with variable order. We consider operators of convolution type. The stability of fractional variable order systems is one of the important property that is analysed in order to study the behaviour of the considered systems. As our definition of fractional variable order difference is a convolution type, the Z-transform is used as an effective tool for the stability analysis. In the equations we put two operators with different order functions and then describe stability regions for them. We describe regions of the stability for systems accordingly to locus of parameters of considered equation. We compare our results to those with constant order terms as with continuous fractional operators of constant order. Our results are illustrated by numerical examples for different order functions.

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