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A NEW DISCRETIZATION METHOD FOR FRACTIONAL ORDER DIFFERENTIATORS VIA CONTINUED FRACTION EXPANSION

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ABSTRACT

In this contribution, to discretize the fractional order differentiators in continuous time domain, a new IIR (infinite impulse response) type digital fractional order differentiator (DFOD) is proposed by using a new family of first order digital differentiators expressed in the second order IIR filter form. The integer first order digital differentiators are obtained by the stable inversion of the weighted sum of Simpson integration rule and the trapezoidal integration rule. The distinguishing point of the proposed DFOD lies in an additional tuning knob to compromise the high frequency approximation accuracy.

Key words: Fractional differentiator, fractional-order dynamic systems, fractional-order differentiator, discretization, Tustin operator, Al-Alaoui operator, recursive.

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