

Sampling for control and integral sums. The role of fractional calculus

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Digital control is based on sampling and, in many cases, the obtention of discrete equivalents of plants and controllers. On the one hand, the mathematical foundations of both operations are the quadrature formulas and methods for numerical integration; and on the other hand, each method of quadrature leads to different types of dynamical systems and the use of the proper tools for analysis and design. The normal approach is the periodic sampling, that can be call Riemann sampling by its analogy with integration theory, and leads to time driven control and, for linear time-invariant plants, closed loop systems linear and periodic. The alternative is the use of event-triggered sampling, a nonperiodic sampling rule in which the output signal is sampled only when a specified event occurs. Depending on the definition of the event, the analog integral sum could be Lebesgue, Stieltjes, or any other, and leads to nonlinear and/or time-variant systems. This talk is a review of some of these approaches, and an inquiry on the role that can be played by the fractional integral in this game.