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Stieltjes differential equations as mathematical models with dead times and sudden changes

Rodrigo López Pouso
(Profesor Titular, rodrigo.lopez@usc.es)
University of Santiago de Compostela, Department of Statistics,
Mathematical Analysis and Optimization, Spain

Abstract

Stieltjes differential equations, which contain equations with impulses and equations on time scales as particular cases, simply consist on ODEs with usual derivatives replaced by derivatives with respect to a nondecreasing function. In this talk we shall describe the basic theory on Stieltjes differential equations along with one of its real world applications. Specifically, we show that Stieltjes differential equations are specially suitable to study populations which exhibit dormant states and/or very short (impulsive) periods of reproduction. In particular, we construct a mathematical model for

the evolution of a silkworm population which can be explicitly solved, as it consists on a linear Stieltjes equation.

Keywords: Stieltjes differential equations; impulsive differential equations; differential equations on time scales; measure differential equations.

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