

Existence and uniqueness of solutions of differential equations with respect to non-additive measures

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Abstract

By taking Sugeno-derivative into account, firstly, we investigate the existence of solutions to the initial value problems (IVP) of first-order differential equations with respect to non-additive measure (more precisely, distorted Lebesgue measure). It particularly occurs in the mathematical modeling of biology. We begin by expressing the differential equation in terms of ordinary derivative and the derivative with respect to the distorted Lebesgue measure. Then, by using the fixed point theorem on cones, we construct an operator and prove the existence of positive increasing solutions on cones in semi-order Banach spaces. In addition, we also use Picard's-Lindelöf theorem to prove the existence and uniqueness of the solution of the equation. Second, we investigate the existence of a solution to the boundary value problem (BVP) on cones with integral boundary conditions of a mix-order differential equation with respect to non-additive measures. Moreover, the Krasnoselskii fixed point theorem is also applied to both BVP and IVP and obtains at least one positive increasing solution. Examples with graphs are provided to validate the results.

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IVP and BVP_MMAS_New.pdf available at <https://authorea.com/users/171542/articles/567837-existence-and-uniqueness-of-solutions-of-differential-equations-with-respect-to-non-additive-measures>



