

A New Web-stepwise Solver for Ordinary Differential Equations

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Abstract

In this paper we introduce SODES (Step-wise Ordinary Differential Equations Solver) which is a new solver for Ordinary Differential Equations (ODE). SODES can be used not only as a solver but also as a tutorial for the teaching and learning process of ODE, since it provides the solution displaying all the the steps needed to obtain it.

In [1] we introduced SFOPDES (Step-wise First Order Partial Differential Equations Solver) developed in DERIVE, a Computer Algebra System (CAS). Two of the future works related considered in [1] were the development of new step-wise solvers for different math topics and the use of other CAS and programming with PYTHON. This way, it is possible to develop web applications, freely available, providing different step-wise solvers. In this sense, SODES is the first work related with both ideas.

Therefore, SODES is a web solver for ODE, developed in PYTHON (using its CAS module SYMPY).

SODES increases the types of ODE that SFOPDES can deal with. Specifically, it provides, step by step, the solution of the following types of ODE:

1. **First-order ODE**: separable equations and equations reducible to them, homogeneous equations and equations reducible to them, exact differential equations and equations reducible to them (integrating factor technique), linear equations, the Bernoulli equation, the Riccati equation, First-order differential equations and nth degree in y' , Generic programs to solve first order differential equations.
2. **Higher-order ODE**: higher order linear equations with constant coefficients.

As a final remark, actually, SODES can be used in English, French or Spanish, but it can be easily extendable to other languages.

References

1. JOSÉ LUIS GALÁN-GARCÍA AND GABRIEL AGUILERA-VENEGAS AND PEDRO RODRÍGUEZ-CIELOS AND YOLANDA PADILLA-DOMÍNGUEZ AND MARÍA Á. GALÁN-GARCÍA. SFOPDES: A Stepwise First Order Partial Differential Equations Solver with a Computer Algebra System. *Computers and Mathematics with Applications*. Volume 78(9), 2019, 3152-3164. doi: 10.1016/j.camwa.2019.05.010.