

Teaching Partial Differential Equations With a CAS

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Abstract

It is very common that Engineering students find difficulties when studying advanced Mathematics subjects. To help in the teaching and learning process of such subjects, the teacher can use an adequate mathematical software. But not always the used given to these specific pieces of software is the right one. The use of a Computer Algebra System (CAS) to achieve this goal is a good idea mainly because programming with a CAS, the solution to a problem can be obtained step by step. This way, the student can check all the intermediate steps to get the solution and can find the step or steps where the student made a mistake.

In this talk, we introduce SPDES, a Stepwise Partial Differential Equation Solver (an extension of SFOPDES introduced in [1]). SPDES deals with some second order PDE in addition to the first order PDE considered in SFOPDES. SPDES can be used as a self tutorial for PDE since it solves, step by step, the typical exercises within the topic. The type of PDE that SPDES can solve are: Pfaff Differential Equations, Quasi-linear PDE, Lagrange-Charpit Method for first order PDE, Heat equation, Wave equation and Laplace's equation.

SPDES has been developed using the programming capabilities of the CAS DERIVE, providing not only the final result but also, optionally, the display of all the steps needed to solve typical exercises on PDE.

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.