A Toolbox with DERIVE: Calculus on Several Variables

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Abstract

A toolbox is a set of procedures taking advantage of the computing power and graphical capacities of a CAS. With these procedures the students can solve math problems, apply mathematics to engineering or simply reinforce the learning of certain mathematical concepts.

From the point of view of their construction, we can consider two types of toolboxes:

 (i) the closed box, built by the teacher, in which the utility files are provided to the students together with the respective tutorials and several worksheets with proposed exercises and problems,

 (ii) the open box, in which the students are free to construct, under teacher's direction, their own toolbox, which the procedures useful for solving some problems.

Both models have pedagogical advantages and disadvantages. The ideal model will probably be a transition from the closed model, appropriate in the first year of engineering studies, to the open box model, useful for advanced mathematical topics.

The authors have experience in building both boxes using different CAS. This paper presents a closed box model, made with DERIVE, with procedures relating to the contents of a course in differential calculus of several variables. In the experiment, carried out during the 2012–2013 academic year at the Pontificia Comillas University, the students have received the toolbox. The students, working in a team, solved the problems proposed in the worksheets. They have delivered the files and they have completed a survey that attempts to measure the usefulness and satisfaction of the experience.

Keywords
Toolboxes, Computer Algebra Systems, Engineering studies