

Symbolic computation with the sygnm computer algebra system

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Abstract

As computational methods become increasingly important in scientific research, engineering and education there is a high demand for all kinds of mathematical software. Computer algebra systems aim to provide both symbolic and numerical capabilities covering a wide range of mathematical topics. The development of some of the most widely used computer algebra systems has began over 30 years ago, which means that these systems are outdated in some aspects and do not fully take advantage of new technologies and software engineering methods that appeared since then. A new, modern computer algebra system architecture and its implementation is presented which fixes several problems of current systems, can be used interactively or as a library through popular programming languages, features a type system inspired by functional programming and is highly modular. The new system is open source, portable, and relies on already available high quality mathematical libraries which enables fast development while avoiding unnecessary reimplementations of basic mathematical functionality. This results in software that is not only interesting from a theoretical viewpoint but is also usable in practice. Beyond the core system, the design of the most important mathematical packages and some user interfaces are also discussed.

Keywords: computer algebra, symbolic computation, computer algebra system

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