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A bridge between dynamic geometry and computer algebra.  (English) [Zbl 1073.68899]

Summary: Both Computer Algebra Systems (CASs) and dynamic geometry systems (DGSs) have reached a high level of development. Some CASs (like Maple or Derive) include specific and powerful packages devoted to Euclidean geometry, but CASs have incorporated neither mouse drawing capabilities nor dynamic capabilities. Meanwhile, the well-known DGSs do not provide algebraic facilities.

Maple’s and Derive’s paramGeo packages and the DGS-CAS translator (all freely available from the authors) make it possible to draw a geometric configuration with the mouse (using The Geometer’s Sketchpad 3 or 4) and to obtain the coordinates, equations, etc., of the drawn configuration in Maple’s or Derive’s syntax. To obtain complicated formulae, coordinates of points or equations of loci, to perform automatic theorem proving and to perform automatic discovery directly from sketches are examples of straightforward applications. Moreover, this strategy could be adapted to other CASs and DGSs.

This work clearly has a didactic application in geometric problems exploration. Nevertheless, its main interest is to provide a convenient time-saving way to introduce data when dealing with rule and compass geometry, which has a wider scope than only educational purposes.

MSC:
68W30 Symbolic computation and algebraic computation
65D18 Numerical aspects of computer graphics, image analysis, and computational geometry
68T15 Theorem proving (deduction, resolution, etc.) (MSC2010)

Keywords:
Computer algebra; Dynamic geometry; Automatic theorem proving; Geometric loci

Software:
AXIOM; MuPAD; CoCoA; Maple; REDUCE; Mathematica; Geometer’s Sketchpad; Cinderella; DERIVE

Full Text: DOI

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