

Symbolic Solution of Parametric Polynomial Systems with the Dixon Resultant

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Systems of polynomial equations with parameters arise in many fields, such as geometric computing, flexibility of molecules, chemical reactions, dynamical systems, game theory, image analysis, operations research, global positioning systems, and differential equations. In most applied problems, the best method for their symbolic solution is the Dixon-EDF resultant. We will briefly describe the method itself, then discuss problems arising from analysis of point cloud data, image processing, and other fields.

We will carefully compare Dixon-EDF to several implementations of Gröbner bases algorithms on several systems. We find that Dixon-EDF is greatly superior, often by several orders of magnitude.

Keywords: polynomial system, parameter, resultant, Dixon, determinant, symbolic computing, Gröbner basis.