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关于李变换的机器实现

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摘 要：李变换是一种常用的求奇异摄动问题摄动解的方法.在求弱非线性系统的有效渐近展开式解时,利用李级数与李变换能得到一种较为完整和有效的方法.计算机代数是应用数学的一个边缘学科,基于采用Lindstedt-Poincare方法、多重尺度法、平均化方法自动求解问题,应用Mathematica系统的强大的符号运算功能以及该系统提供的控制语句,不但实现变量和任意函数到新变量的变换,而且可以实现李变换及其正则系统的自动求解.对李变换平均方法Lie Transform[]函数,它虽然不能处理非自治问题的摄动问题的自动求解,但李变换正则系统Lie Transform[]函数可以处理非自治系统的微分方程问题,化简微分系统,降低阶数,并将该处理过程做成相关的软件包,简便、实用.

关键字：李变换;有效渐近解;正则系统

On automatical solutions of the Lie transformation

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Abstract: Lie transfromation is a usual method of the perturbed solution that has solved the singular perturbed problems .By using Lie series and Lie transformation an effective technique is obtained on some solutions of effectively asymptotic expansions to a weakly nonlinear system in this paper, and some automatically solving problems of the Lie transformation are considered which would use powerful symbolic operation and control sentence provided bymathematica system. Based on automatical solutions of Lindsted t-Poincare method, multiple scale method and averaging method, , Lie transformation[] function of the regular system of Lie transformation can treat the problems from higher dimensions to lower dimensions of the ordinary differential equations. The authors compile these programs and integrated into packages, which can be ex-
panded, and is considered as teaching soft wave about perturbation method.

Key words: Lie transformation; effectively asymptotic solutions; regular system

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