

信号处理中一类非线性方程组的快速求解

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收稿日期 2008-2-13 修回日期 网络版发布日期 2008-9-2 接受日期

摘要 在声纳和雷达信号处理中,需要求解一类维数可变的非线性方程组,这类方程组具有混合三角多项式方程组形式.由于该问题有很多解,且其对应的最小二乘问题有很多局部极小点,用牛顿法等传统的迭代法很难找到有物理意义的解.若把它化为多项式方程组,再用解多项式方程组的符号计算方法或现有的同伦方法求解,由于该问题规模太大而不能在规定的时间内求解,而当考虑的问题维数较大时,利用已有的方法甚至根本无法求解.

综合利用我们提出的解混合三角多项式方程组的混合同伦方法和保对称的系数参数同伦方法,我们给出该类问题一种有效的求解方法.利用这种方法,可以达到实时求解的目的,满足实际问题的需要.

关键词 [多项式方程组](#),[混合三角多项式方程组](#),[同伦方法](#),[混合方法](#).

分类号 [34A34](#), [65H10](#)

A Fast Algorithm for a Class of Nonlinear Systems in Signal Processing

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Abstract In signal processing of sonar and radar, we meet a class of nonlinear systems with alterable dimensions, and every equation in the system is a mixed trigonometric polynomial. Because this class of systems have many solutions, and its corresponding least square problems have many local minimal solutions, the classic iteration methods, e.g. Newton's method, can not be applied to find the solutions. On the other hand, if this class of systems is transformed into polynomial systems, and then homotopy methods or symbolic methods is used to solve them, then the solutions can not be found in a short time due to the high complexity. And unfortunately, if the dimension of the problems is very large, this class of systems even can not be solved by the above methods. Combining the hybrid methods presented for mixed trigonometric polynomial systems and the coefficient-parameter homotopy keeping the symmetry of the target system, an effective solving method is presented.

Key words [Polynomial systems](#) [mixed trigonometric polynomial systems](#) [homotopy method](#) [hybrid method](#).

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