

Rank of Projection-Algebraic Representations of Some Differential Operators

Oksana Bihun, Mykola Prytula

(Submitted on 16 Nov 2010)

The Lie-algebraic method approximates differential operators that are formal polynomials of $\{1, x, d/dx\}$ by linear operators acting on a finite dimensional space of polynomials. In this paper we prove that the rank of the n -dimensional representation of the operator $K = a_k d^k/dx^k + a_{k+1} d^{k+1}/dx^{k+1} + \dots + a_{k+p} d^{k+p}/dx^{k+p}$ is $n-k$ and conclude that the Lie-algebraic reductions of differential equations allow to approximate only some of solutions of the differential equation $K[u] = f$. We show how to circumvent this obstacle when solving boundary value problems by making an appropriate change of variables. We generalize our results to the case of several dimensions and illustrate them with numerical tests.

Comments: 19 pages, 1 figure

Subjects: **Classical Analysis and ODEs (math.CA)**; Numerical Analysis (math.NA)

MSC classes: 34K28, 65N22, 15A03, 34B05

Cite as: [arXiv:1011.3782v1](https://arxiv.org/abs/1011.3782v1) [math.CA]

Submission history

From: Oksana Bihun [[view email](#)]

[v1] Tue, 16 Nov 2010 18:32:16 GMT (26kb,D)

[Which authors of this paper are endorsers?](#)

Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

[math.CA](#)

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1011](#)

Change to browse by:

[math](#)

[math.NA](#)

References & Citations

- [NASA ADS](#)

Bookmark ([what is this?](#))

