Use of the Operational Calculus Approach in the Environment of a Computer Algebra System

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Abstract

Usually the Operational Calculus Approach is connected with the Laplace Transformation. In contrast, we consider the use of the Heaviside - Mikusinski Operational Calculus and its extensions for solution of some classes of linear problems. The based on this calculus direct Heaviside algorithm is used for solution of problems related to linear ordinary differential equations (LODE). Bernoullian Operational Calculus and a modified Heaviside algorithm based on this calculus is used for obtaining periodic solutions of LODE (including the so-called resonance cases). Second order Operational Calculi are used for solution of local and nonlocal boundary value problems, related to the heat equation, the wave equation and the equation of a supported beam.

The implementation and the advantages of use of the above methods in the environment of a Computer Algebra System (*Mathematica* in our case) are considered and illustrated with examples.