On Invariant Solutions of Some P(1,4)-Invariant d'Alembert Equations

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ABSTRACT

Linear and nonlinear d'Alembert equations in spaces of different dimensions are widely used to solve various problems of differential geometry, theory of nonlinear waves, theoretical and mathematical physics (see, e.g., [1, 2, 3, 4, 5]).

Let us consider the following differential equations:

1. $\Box_5 u = \lambda u, \ \lambda \in R,$
2. $\Box_5 u = \sin u,$
3. $\Box_5 u = e^u,$
4. $\Box_5 u = \sinh u,$

where $\Box_5$ is the d'Alembert operator in the five-dimensional Minkowski space $M(1,4)$.

Equations 1–4 are invariant with respect to the Poincaré group $P(1,4)$.

Until now, using the subgroup structure of the group $P(1,4)$ as well as invariants of its nonconjugate subgroups, we have performed the symmetry reduction for the above mentioned equations and constructed some classes of exact solutions for them.

1. Ablowitz M.J., Segur H. Solitons and the Inverse Scattering Transform, *SIAM Studies in Appl. Math.*, **4**, (Philadelphia 1981).
2. Barbashov B.M., Nesterenko V.V. Introduction to the Relativistic String Theory (Singapore 1990).
3. Bhatnagar P.L. Nonlinear Waves in One-Dimensional Dispersive Systems (Oxford 1979).
4. Kadyshevskii V.G. A new approach to the theory of electromagnetic interactions, *Fiz. Element. Chastits Atom. Yadra*, **11** (1980), 5–39.
5. Grundland A.M., Tuszyński J.A., and Winternitz P. Group theory and solutions of classical field theories with polynomial nonlinearities, *Found. Phys.*, **23** (1993), 633–665.