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Higher spin Laplace operator in several vector variables

This presentation deals with the construction of so-called higher spin Laplace operators. These are conformally invariant differential operators which generalise the Laplace, Maxwell and Fronsdal equations known in theoretical physics to arbitrary dimension and for higher spin fields. We do this using harmonic analysis and representation theory of some classical Lie algebras. The classical Laplace operator maps complex valued functions to complex valued functions, and we can see the space of complex numbers as a representation of the rotation group. In order to generalise this operator, we use Branson's result on second-order conformally invariant operators to switch out the space of complex numbers by another irreducible representation of the orthogonal group. These representations can be modelled as spaces of polynomials in several vector variables, whence our operator can be written down as a second order differential operator acting on functions of several variables.
Next, we want to determine all polynomial solutions to these operators. Therefore, we impose some gauge fixings and consider a special kind of solutions of these higher spin Laplace operators, which we will be able to determine completely. This will make it possible to construct all other solutions from these special ones.

This is joint work with D. Eelbode and M. Roels (University of Antwerp)