

Research Plan

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Killing-Yano symmetry has been studied as a fundamental hidden symmetry which plays a crucial role in black hole spacetimes. It is an interesting question whether the Killing-Yano symmetry and its generalizations can provide new insights into the theory of black holes. I believe that it would be useful to approach some problems from the view point of Killing-Yano symmetry.

Killing-Yano symmetry of supergravity black holes

All the results I have obtained generalize to $D=4, 5, 6, 7$ black holes of gauged supergravities in the case when some charges are set equal and other charges vanish, because such solutions can be cast in the same form as ungauged ones. I am going to elaborate on and reveal hidden symmetry of the gauged supergravity black holes.

Separability structure

In four dimensions there is a direct link between the existence of Killing-Yano symmetry and separability of Maxwell's equations. In higher dimensions such a link, if it exists, remains to be shown. Regarding separability of gravitational perturbations, the connection with Killing-Yano symmetry is not obvious even four dimensions. Though I have considered this problem, there is no progress at the moment. However, I will approach this problem.

Higher-dimensional C-metric

The C-metric in higher dimensions is not known and it will be a big breakthrough when somebody find it. People want the C-metric in five dimensions very much to use it for Randall-Sundrum models. However, until now all attempts to find it have broken down. In four dimensions, the C-metric has only a CKY tensor, not a closed CKY. For this reason, it would be very interesting to try to find a general metric with a CKY tensor, since the higher-dimensional C-metric could be in this class.

Other problems

There are other interesting problems for higher-dimensional black holes. In addition to hidden symmetries, I would like to tackle remaining problems of higher-dimensional black holes in the coming years.