Research Plan

Objectives

Analysis of higher dimensional black holes in the Large D limit

The Einstein equation is the non-linear partial differential equation, which is quite difficult to solve in general. In the large D limit, however, the Einstein equation reduces its inhomogeneity by one and becomes much more tractable. My research objective is to study the property and dynamics of higher dimensional black holes in more general shapes and with various matter fields and modified gravity theory by the large D expansion method.

Research Plan

Toward the objectives and considering the above result, I am planning the following researches.

Exploring the stationary black holes in the large D limit

The large D limit greatly simplifies the Einstein equation, in which the analysis of non-uniform solutions becomes easier to solve. I and collaborators have shown several non-uniform solutions in the vacuum spacetime. I will study the higher dimensional solutions in more general cases, such with the charges and other matter sources and even with the modified gravity.

Black hole dynamics in the large D limit

I and collaborator showed that the large D expansion also work with the time dependence as well.

Especially, we showed that the instability of the uniform black string grows and settles down to the non-uniform solution at last. While, in general, the numerical relativity in the higher dimension requires many computational resources, the large D limit reduces the Einstein equation to the simpler effective equation, which will need much less computational resources. I will study the shape and dynamics in more general spacetime with/without charges and other matter fields.