[Brief Review*]

Bulk reconstruction of metrics with a compact space asymptotically [1]

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The light-cone cut method [2, 3] is extended to the spacetime with a compact space. Here again we focus on the past cuts.

In order to reconstruct the bulk conformal metric by light-cone cuts, one have to collect inward null vectors at points on cuts, including the component of the compact space. Because the compact space shrinks up, the coordinate on $\mathbb{S}^k$ of $x \in C^-(p)$ is defined as asymptotical value of null geodesics, which is denoted by $\Phi(x)$. When the spacetime has compact space, although a point on a cut is not a caustic, the point would have two ore more null geodesics coming into the point. Therefore, we define the regular point on $C^-(p)$ as the point into which a unique null geodesic comes, in order to get well-defined asymptotical coordinate on $\mathbb{S}^k$. The set of regular points of $C^-(p)$ is written as $G^-(p)$. Then we define the past extended light-cone cuts as follows:

$$\mathcal{C}^-(p) = \{(x, \Phi(x)) |\, x \in G^-(p)\}. \tag{1}$$

The similar proof to the one in [2] gives the fact that, when $\mathcal{C}^-(p)$ and $\mathcal{C}^-(q)$ intersect at exactly one point, then p and q are null related. Following the same process in the previous paper gives the light-cone of $P(\leftrightarrow C^-(p))$ in the space of past extended cuts, and determines the conformal metric at P, that is, the conformal metric at p.

In this paper, the spacetime is assumed to be asymptotically $\mathrm{AdS}_n \times \mathbb{S}^k$, but the asymptotical form of the compact space would be generalized (discussed in section 5).

References

[1] S. Hernández-Cuenca and G.T. Horowitz, *Bulk reconstruction of metrics with a compact space asymptotically*, *JHEP* **08** (2020) 108 [2003.08409].

[2] N. Engelhardt and G.T. Horowitz, *Towards a Reconstruction of General Bulk Metrics*, *Class. Quant. Grav.* **34** (2017) 015004 [1605.01070].

[3] N. Engelhardt and G.T. Horowitz, *Recovering the spacetime metric from a holographic dual*, *Adv. Theor. Math. Phys.* **21** (2017) 1635 [1612.00391].

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