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Does Boundary Distinguish Complexities?

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Recently, Chapman et al. argued that holographic complexities for defects distinguish action from volume. Motivated by their work, we study complexity of quantum states in conformal field theory with boundary. In generic two-dimensional BCFT, we work on the path-integral optimization which gives one of field-theoretic definitions for the complexity. We also perform holographic computations of the complexity in Takayanagi's AdS/BCFT model following by the "complexity = volume" conjecture and "complexity = action" conjecture. We find that increments of the complexity due to the boundary show the same divergent structures in these models except for the CA complexity in the AdS3/BCFT2 model as the argument by Chapman et al. Thus, we conclude that boundary does not distinguish the complexities in general.

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