The Rolling Lamp Problem and Related Link Structure

Jiang, Qingxuan

The rolling lamp, a cultural heritage in China, also represent a kind of structure that is interesting mathematically. We define a math model of the rolling lamp, which is an arrangement of great circles on a sphere. We consider those circles as the components of a link, and we can change the crossings of the great circles from over to under or vice versa. We prove that we can always obtain an alternating link for any number of great circles and any initial configuration. Thus, we prove that the rolling lamp exist for any number of circular bands and give an algorithm for its construction. We define the obtained link as the rolling lamp structure and discuss its invariants and its position in the world of knots. Moreover, we prove the Sylvester-Gallai theorem on spherical plane with aid of this structure.

Awards Won:
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