Geodesic Lines on Archimedean Solids

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Purpose: The problem of finding the shortest path between the two given points is a classical problem in geometry. These paths are called geodesic lines. The existence of non-self-intersecting closed geodesics is special interest. Nowadays people are able to find all possible closed geodesics on some smooth surfaces, such as a sphere, and on regular polyhedra. I studied geodesic lines on Archimedean solids, which are the most similar in properties to regular polyhedra. I proposed a hypothesis that every Archimedean solid has a closed geodesics. Procedure: In research I used a polyhedron's net. I searched for two edges on the net, which coincide on polyhedron. Then I looked for two points with the similar property. Line which connects that points is geodesic. Results: 1) I found some classes of closed geodesic lines on all Archimedean solids; 2) The hypothesis about geodesics on Archimedean solids was proved and I formulate a theorem: "All Archimedean solids have at least 1 geodesic line." Conclusion: This research showed which classes of closed non-self-intersecting geodesic lines exist on Archimedean solids. In future I plan to study other polyhedra, such as Catalan and Johnson solids.

Awards Won:
American Mathematical Society: Certificate of Honorable Mention