CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
36017

Project Title
How to Wrap a Sphere

Abstract

Objectives/Goals
My goal is to find shapes that wrap a unit sphere with small area and perimeter in order to economize material usage in wrapping spherical objects.

Methods/Materials
I defined wrapping to be a noncrossing contractive mapping of a piece of paper into Euclidean 3-space, specifically sphere here. I computed and compared four different methods of wrapping a sphere -- two circles wrapping, two circles and a strip wrapping, strip wrapping, and petal wrapping.

Results
Two circles wrapping generates a 23.35% area waste but small perimeter. Two circles and strip wrapping generates a 7.08% area waste but big perimeter. In both petal wrapping and strip wrapping, as the number of petals increases and the width of strip decreases, the area of wrapping paper decreases and will approach infinitely close to the surface area of the sphere. However, the perimeters of strip increase much more rapidly than those of petals.

Conclusions/Discussion
From my project it is concluded that petal wrapping is the most optimal method in order to minimize material usage in wrapping spherical objects. The result is also useful to problems involving unfolding spheres from 3-dimension to 2-dimension, such as map projection and disassembly and reconstruction of spherical objects.

Summary Statement
I devised and compared four different methods of wrapping a unit sphere with a flat piece of paper.

Help Received
I designed and performed this research by myself, did some computations by calculator TI-nspire, and consulted several Internet sources.