

2017 年臺灣國際科學展覽會 優勝作品專輯

作品編號 010042

參展科別 數學

作品名稱 **The Locus of Mid-Tangent Points of Planar
Curves**

得獎獎項 三等獎

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Abstract

In this project, we defined a mid-tangent point with respect to a fixed point X and a tangent at a point Y on a planar curve C as a point on the tangent that is equidistant from X and Y . We studied the locus of mid-tangent points of conic sections. We found that the locus of mid-tangent points of most conic sections are non-linear curves. However, we observed and proved by using Euclidean geometry that the locus of mid-tangent points of circles are straight lines. The mapping defined by mid-tangent points was studied further. The similarity between a mid-tangent mapping and a stereographic projection was displayed as a one – to – one correspondence function. We also extended the concept of mid-tangent points to three dimensional space and found that the similarity with the stereographic projection was retained in higher dimensions. Finally, we studied the locus of mid-tangent points of a sphere to create a mapping of the sphere to a plane.

【評語】 010042

In this project, the authors studied the locus of mid-tangent points curves obtained by conic sections. Although most of them are non-linear curves. The authors proved a special case that the locus of mid-tangent points of circles are straight line by analytic geometry. The mathematics of the proof appears to be correct but Figure 4 of step 2 requires modification. An interesting application is to compare the map defined by the mid-tangent point of circle and a sphere with the stereographic projection. When the sphere is replaced by an ellipse, a good approximation is observed by comparing the maps of Taiwan and Thailand. Overall, this is a nice piece of work, containing both mathematics and applications.