Analysis of Hypocycloid Formation Processes From Different Perspectives and Polygonal Structures Seen in Trace Curves

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In this study, the definition of hypocycloid, the logic of its formation and its types are expressed. Hypocycloid is a curve traced out by a point on a rolling circle as it rolls around inside another fixed circle. Hypocycloids are shown as hy[theta; n, m, beta]. Hypocycloids can be applied in many fields especially in engineering. A new hypocycloid drawing program has been created. In the formation processes of hypocycloids; similarity, number of rounds, periods, the relationship between theta and beta angles, the value ranges of the theta and beta angles, have been defined and how they are calculated have been explained. The relationship between theta and (theta)' angles at the same point in the same figure of a hy[theta; n, m, beta] and hy[(theta)'; n, n-m, beta] hypocycloids has been examined. The T center angle of the fixed circle subtended by the trace curve has been calculated. A mathematical expression has been stated concerning the number of times the point that leaving a mark reaches all positions on the rolling circle. Features about star polygonal hypocycloids have been obtained. Various hypocycloid transformation expressions have been formed according to the numbers added to n and m numbers. The hypocycloids have been examined linearly, and their unique number sequences have been created. After linear examination, a new hypocycloid definition, hypocycloid drawing method, mathematical expressions about the points that form the corners of hypocycloids and amount of the residual part have been developed. New conclusions have been reached on matrices produced from hypocycloids. Finally, the proposed mathematical expressions are proved separately.

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