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Characteristic parameter sets and limits of circulant Hermitian polygon transformations.

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Summary: Polygon transformations based on taking the apices of similar triangles constructed on the sides of an initial polygon are analyzed as well as the limit polygons obtained by iteratively applying such transformations. In contrast to other approaches, this is done with respect to two construction parameters representing a base angle and an apex perpendicular subdivision ratio. Furthermore, a combined transformation leading to circulant Hermitian matrices is proposed, which eliminates the rotational effect of the basic transformation. A finite set of characteristic parameter subdomains is derived for which the sequence converges to specific eigenpolygons. Otherwise, limit polygons turn out to be linear combinations of up to three eigenpolygons. This leads to a full classification of circulant Hermitian similar triangles based polygon transformations and their limit polygons. As a byproduct classical results as Napoleon's theorem and the Petr-Douglas-Neumann theorem can be easily deduced.

MSC:

[51M04](#) Elementary problems in Euclidean geometries

[52B15](#) Symmetry properties of polytopes

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Keywords:

[polygon transformation](#); [eigenpolygon](#); [limit polygon](#); [circulant matrix](#); [Hermitian matrix](#); [Napoleon's theorem](#); [Petr-Douglas-Neumann theorem](#)

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