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# TWO CHERNOFF–TYPE INEQUALITIES AND THEIR STABILITY PROPERTIES

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*Abstract.* Two Chernoff-type inequalities are obtained by Fourier series expansion, and a conjecture on the reverse isoperimetric inequality made by Pan et al. [Math. Inequal. Appl. **13** (2010), 329–338] is proved as an application of these inequalities. Furthermore, stability versions of the inequalities are obtained based on the Hausdorff distance and the $L_2$ metric, respectively.

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## REFERENCES

[1] I. CHAVEL, *Isoperimetric Inequalities*, Differential Geometric and Analytic Perspectives, Cambridge University Press, 2001.
[2] P. R. CHERNOFF, *An area-width inequality for convex curves*, Amer. Math. Monthly **76**, 1 (1969), 34–35.
[3] R. COURANT, *Differential and Integral Calculus, Vol. II, McShane E. J. transi*, Interscience, New York, 1936.
[4] N. DERGIADES, *An elementary proof of the isoperimetric inequality*, Forum Geom. **2**, 1 (2002), 129–130.
[5] X. GAO, *A note on the reverse isoperimetric inequality*, Results. Math. **59**, 1–2 (2011), 83–90.
[6] L. GAO AND Y. L. WANG, *Stability properties of the generalized Chernoff inequality*, Math. Inequal. Appl. **15**, 2 (2012), 281–287.
[7] L. Y. GAO, Z. Y. ZHANG AND F. ZHOU, *An extension of Rabinowitz's polynomial representation for convex curves*, Beiträge Algebra Geom. **61**, 3 (2020), 455–464.
[8] R. J. GARDNER, *The Brunn-Minkowski inequality*, Bull. Amer. Math. Soc. **39**, 3 (2002), 355–405.
[9] H. GROEMER, *Geometric applications of Fourier series and spherical harmonics*, Encyclopedia of Mathematics and its Applications, Vol. **61**, Cambridge University Press, 1986.
[10] C. C. HSIUNG, *A First Course in Differential Geometry*, Pure Appl. Math. Wiley, New York, 1981.
[11] E. LUTWAK, *Mixed width-integrals of convex bodies*, Israel J. Math. **28**, 3 (1977), 249–253.
[12] Y. Y. MAO AND Y. L. YANG, *A generalized mixed width inequality and a generalized dual mixed radial inequality*, Results Math. **74**, 3 (2019), 123.
[13] R. OSSERMAN, *The isoperimetric inequality*, Bull. Amer. Math. Soc. **84**, 6 (1978), 1182–1238.
[14] K. OU AND S. L. PAN, *Some remarks about closed convex curves*, Pacific J. Math. **284**, 2 (2010), 393–401.
[15] S. L. PAN, X. Y. TANG AND X. Y. WANG, *A refined reverse isoperimetric inequality in the plane*, Math. Inequal. Appl. **13**, 2 (2010), 329–338.
[16] S. L. PAN AND H. ZHANG, *A reverse isoperimetric inequality for convex plane curves*, Beiträge Algebra Geom. **48**, 1 (2007), 303–308.
[17] R. SCHNEIDER, *Convex bodies: The Brunn-Minkowski Theory*, second expanded edition, Cambridge University Press, Cambridge, 2014.
[18] D. Y. ZHANG, *A mixed symmetric Chernoff type inequality and its stability properties*, J. Geom. Anal. **31**, 5 (2021), 5418–5436.
[19] D. Y. ZHANG AND Y. L. YANG, *The dual generalized Chernoff inequality for star-shaped curves*, Turkish J. Math. **40**, 2 (2016), 272–282.

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[20] M. ZWIERZYŃSKI, *The improved isoperimetric inequality and the Wigner caustic of planar ovals*, J. Math. Anal. Appl. **442**, 2 (2016), 726–739.