Journal of Mathematical Inequalities
Volume 12, Number 4 (2018), 1107–1116
doi:10.7153/jmi-2018-12-85

THE BÉZIER VARIANT OF LUPAS KANTOROVICH OPERATORS BASED ON POLYA DISTRIBUTION

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Abstract. In this paper we introduce the Bézier variant of Lupas Kantorovich operators based on Polya distribution. We establish a direct approximation by means of the Ditzian-Totik modulus of smoothness and a global approximation theorem in terms of second order modulus of continuity. Furthermore, we give the rate of convergence for absolutely continuous functions having a derivative equivalent to a bounded function. Our results extend the work of Agrawal [P. N. Agrawal, N. Ispir and A. Kajla, Approximation properties of Lupas-Kantorovich operators based on polya distribution, Rendiconti del Circolo Matematico di Palermo Series 2, 2016, 65 (2): 185–208] and Ispir [N. Ispir, P. N. Agrawal and A. Kajla, Rate of convergence of Lupas Kantorovich operators based on Polya distribution, Appl. Math. Comput., 2015, 261: 323–329].

Mathematics subject classification (2010): 41A36, 41A25, 41A10.
Keywords and phrases: Bézier operators, Polya distribution, rate of convergence, absolutely continuous functions.

REFERENCES

[1] L. LUPAS AND A. LUPAS, *Polynomials of binomial type and approximation operators*, Stud. Univ. Babes-Bolyai Math., 1987, **32** (4): 61–69.
[2] D. MICLAUS, *The revision of some results for Bernstein-Stancu type operators*, Carpathian J. Math., 2012, **28** (2): 289–300.
[3] V. GUPTA AND T. M. RASSIAS, *Lupas-Durrmeyer operators based on polya distribution*, Banach J. Math. Anal., 2014, **8** (2): 146–155.
[4] P. N. AGRAWAL, N. ISPIR AND A. KAJLA, *Approximation properties of Lupas-Kantorovich operators based on polya distribution*, Rendiconti del Circolo Matematico di Palermo Series 2, 2016, **65** (2): 185–208.
[5] N. ISPIR, P. N. AGRAWAL AND A. KAJLA, *Rate of convergence of Lupas Kantorovich operators based on Polya distribution*, Appl. Math. Comput., 2015, **261**: 323–329.
[6] A. ARAL AND V. GUPTA, *Direct estimates for Lupas-Durrmeyer operators*, Filomat, 2016, **30** (1): 191–199.
[7] V. GUPTA, A. M. ACU AND D. F. SOFONEA, *Approximation of Baskakov type Polya-Durrmeyer operators*, Appl. Math. Comput., 2017, **294**: 318–331.
[8] V. GUPTA AND D. SOYBAS, *Convergence of integral operator based on different distributions*, Filomat, 2016, **30** (8): 2277–2287.
[9] V. GUPTA AND R. P. AGARWAL, *Convergence Estimates in Approximation Theory*, Springer International Publishing, Switzerland, 2014.
[10] X. M. ZENG AND A. PIRIOU, *On the rate of convergence of two Bernstein-Bézier type operators for bounded variation functions*, J. Approx. Theory, 1998, **95** (3): 369–387.
[11] X. M. ZENG, *On the rate of convergence of two Bernstein-Bézier type operators for bounded variation functions II*, J. Approx. Theory, 2000, **104** (2): 330–344.
[12] V. GUPTA AND X. M. ZENG, *Rate of approximation for the Bézier variant of Balazs Kantorovich operators*, Math. Slovaca, 2007, **57** (4): 349–358.
[13] B. Y. LIAN, *Rate of approximation of bounded variation functions by the Bézier variant of Chlodowsky operators*, J. Math. Inequal., 2013, **7** (4): 647–657.

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[14] X. M. ZENG AND B. Y. LIAN, *An estimate on the convergence of MKZ-Bézier operators*, Comput. Math. Appl., 2008, **56** (12): 3023–3028.
[15] P. N. AGRAWAL, N. ISPIR AND A. KAJLA, *Approximation properties of Bézier-summation-integral type operators based on Polya-Bernstein functions*, Appl. Math. Comput., 2015, **259**: 533–539.
[16] T. NEER, A. M. ACU AND P. N. AGRAWAL, *Bézier variant of genuine-Durrmeyer type operators based on Polya distribution*, Carpathian J. Math., 2016, **33** (1): 73–86.
[17] R. A. DEVORE AND G. G. LORENTZ, *Construtive Approximation*, Springer-Verlag, Berlin, 1993.
[18] Z. DITZIAN AND V. TOTIK, *Moduli of Smoothness*, Springer, New York, 1987.
[19] R. BOJANIC AND F. CHENG, *Rate of convergence of Bernstein polynomials for functions with derivatives of bounded variation*, J. Math. Anal. Appl. 1989, **141** (1): 136–151.