q-Bernstein bases over triangular domains

Jorge Delgado
Escuela de Ingeniería y Arquitectura
Universidad de Zaragoza
jorgedel@unizar.es

The q-Bernstein, $0 < q \leq 1$, basis of univariate polynomials has played an important role in several fields, such as Computer Aided Geometric Design (CAGD), Approximation Theory or Quantum Calculus. They have received much attention in recent research (cf. [3, 4, 5, 1, 2] and references in there). For the particular case $q = 1$, it coincides with the basis of Bernstein polynomials.

In this talk, q-Bernstein basis functions over a triangular domain will be presented and analyzed. Recurrence relations and properties such us partition of unity and degree elevation will be shown for them. Evaluation algorithms will be presented.

Joint work with: Héctor Orera, Juan Manuel Peña.

References

[1] R. Goldman, P. Simeonov. Two essential properties of (q,h)-Bernstein-Bézier curves. *Appl. Numer. Math.* 96:82–93, 2015.

[2] R. Goldman, P. Simeonov, Y. Simsek. Generating functions for the q-Bernstein bases. *SIAM J. Discrete Math.* 28:1009–1025, 2014.

[3] H. Oruç, G. M. Phillips. q-Bernstein polynomials and Bézier curves. *J. Comput. and Appl. Math.* 151:1–12, 2003.

[4] G. M. Phillips. A de Casteljau algorithm for generalized Bernstein polynomials. *BIT Numer. Math.* 36:232–236, 1996.

[5] G. M. Phillips. Bernstein polynomials based on the q-integers. *Ann. Numer. Math.* 4:511–518, 1997.