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STRUCTURED LOW RANK APPROXIMATIONS OF THE SYLVESTER RESULTANT MATRIX FOR APPROXIMATE GCDS OF BERNSTEIN BASIS POLYNOMIALS*

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Abstract. A structured low rank approximation of the Sylvester resultant matrix $S(f,g)$ of the Bernstein basis polynomials $f=f(y)$ and $g=g(y)$, for the determination of their approximate greatest common divisors (GCDs), is computed using the method of structured total least norm. Since the GCD of $f(y)$ and $g(y)$ is equal to the GCD of $f(y)$ and $\alpha g(y)$, where α is an arbitrary non-zero constant, it is more appropriate to consider a structured low rank approximation $S(\tilde{f},\tilde{g})$ of $S(f,\alpha g)$, where the polynomials $\tilde{f}=\tilde{f}(y)$ and $\tilde{g}=\tilde{g}(y)$ approximate the polynomials $f(y)$ and $\alpha g(y)$, respectively. Different values of α yield different structured low rank approximations $S(\tilde{f},\tilde{g})$, and therefore different approximate GCDs. It is shown that the inclusion of α allows to obtain considerably improved approximations, as measured by the decrease of the singular values σ_i of $S(\tilde{f},\tilde{g})$, with respect to the approximation obtained when the default value $\alpha=1$ is used. An example that illustrates the theory is presented and future work is discussed.

Key words. Bernstein polynomials, structured low rank approximation, Sylvester resultant matrix.

AMS subject classifications. 15A12, 65F35.

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