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Convergence of orthonormal spline series

Let $(t_n)_{n=2}^{\infty}$ be an arbitrary dense sequence of points in the interval $(0,1)$ and $t_0 = 0$, $t_1 = 1$. We define $\mathcal{S}_n$ as the space of piecewise polynomial functions of order k with grid points $(t_j)_{j=0}^{n}$, that are continuously differentiable of order $k-2$ at the points $(t_j)_{j=2}^{n}$. For each n, the space $\mathcal{S}_{n-1}$ has codimension one in S_n and therefore, there exists a unique function (up to sign) $f_n \in \mathcal{S}_n$ that is orthogonal to $\mathcal{S}_{n-1}$ and normalized in L^2. This system of functions (f_n) is called *orthonormal spline system of order* k *corresponding to the point sequence* (t_n). In [1] it is proved that the partial sums $P_n f = \sum_{j=1}^{n} \langle f, f_n \rangle f_n$ converge a.e. with respect to Lebesgue measure to the function f and in [2] it is proved that this partial sums also converge unconditionally in L^p, $p \in (1,\infty)$. In this talk, we will discuss the extension of those results to the periodic setting, [3,4].

References.

[1] M. Passenbrunner and A. Shadrin: On almost everywhere convergence of orthogonal spline projections with arbitrary knots, *J. Approx. Theory* 180 (2014) 77–89.

[2] M. Passenbrunner: Unconditionality of orthogonal spline systems in L^p, *Studia Math.* 222 (2014), no. 1, 51–86.

[3] M. Passenbrunner: Orthogonal projectors onto spaces of periodic splines, *Journal of Complexity* 42 (2017), 85–93.

[4] K. Keryan and M. Passenbrunner: Unconditionality of periodic orthonormal spline systems in L^p, preprint.