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On the sine polarity and the L_p-sine Blaschke-Santaló inequality

This talk is dedicated to study the sine version of polar bodies and establish the L_p-sine Blaschke-Santaló inequality for the L_p-sine centroid body.

The L_p-sine centroid body $\Lambda_p K$ for a star body $K \subset \mathbb{R}^n$ is a convex body based on the L_p-sine transform, and its associated Blaschke-Santaló inequality provides an upper bound for the volume of $\Lambda_p^\circ K$, the polar body of $\Lambda_p K$, in terms of the volume of K. Thus, this inequality can be viewed as the "sine cousin" of the L_p Blaschke-Santaló inequality established by Lutwak and Zhang. As $p \to \infty$, the limit of $\Lambda_p^\circ K$ becomes the sine polar body $K^\diamond$ and hence the L_p-sine Blaschke-Santaló inequality reduces to the sine Blaschke-Santaló inequality for the sine polar body. The sine polarity naturally leads to a new class of convex bodies $\mathcal{C}_e^n$, which consists of all origin-symmetric convex bodies generated by the intersection of origin-symmetric closed solid cylinders. Many notions in $\mathcal{C}_e^n$ are developed, including the cylindrical support function, the supporting cylinder, the cylindrical Gauss image, and the cylindrical hull. Based on these newly introduced notions, the equality conditions of the sine Blaschke-Santaló inequality are settled.