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Title: Directed Projection Functions

Abstract: In a paper from 1997, Groemer introduced the semi-girth of a convex body K in $\mathbb{R}^3$ as a function on pairs (L, u), where $L \subset \mathbb{R}^3$ is a plane and $u \in L$ is a unit vector. He then showed a stability result which implied that this function determines K uniquely (up to translations). We generalize his results in two directions. First we consider general directed projection functions $v_{i,j}(K; L, u)$, for convex bodies K in $\mathbb{R}^d$, where L is a j-dimensional subspace, $2 \leq j \leq d-1$, $u \in L$, and where the girth is replaced by the ith intrinsic volume, $1 \leq i \leq j$, and show a corresponding uniqueness result for $v_{i,j}(K; \cdot)$. Then, we consider the averages of $v_{1,j}(K; L, u)$ (for $d = 3$, $v_{1,2}(K; L, u)$ is the semi-girth) over all L that contain u and show that the resulting functions $\overline{v}_{1,j}(K; \cdot)$ on the unit sphere for certain values of d and j suffice to determine K, whereas for other values this is not the case. For example, $\overline{v}_{1,2}(K; \cdot)$ determines K in all dimensions, whereas $\overline{v}_{1,2i+1}(K; \cdot)$ does not determine K in dimension $d = 3i + 1$, $i = 1, 2, \ldots$. Joint work with Paul Goodey, University of Oklahoma.