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Multiplicity of direct sums of operators on Banach spaces

If T is a bounded operator on a complex Banach space X and T_n denotes the direct sum $T \oplus \cdots \oplus T$ of n copies of T acting on $X \oplus \cdots \oplus X$, we study the sequence $\big(m(T_n)\big)_{n \geq 1}$ of the multiplicities of the operators T_n. Answering a question of Atzmon, we show that this sequence is either eventually constant or grows to infinity at least as fast as n. Then we construct examples of operators on Hilbert spaces such that $m(T_n) = d$ for every $n \geq 1$, where d is an arbitrary positive integer. This answers a question of Herrero and Wogen and characterizes convex sequences which can be realized as a sequence $\big(m(T_n)\big)_{n \geq 0}$ for some operator T on a Hilbert space.

This is joint work with Maria Roginskaya.