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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 $(m(T_n))_{n \geq 1}$ 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 $(m(T_n))_{n \geq 0}$ for some operator $T$ on a Hilbert space.

This is joint work with Maria Roginskaya.