

NOTES ON THE KRUPA–ZAWISZA ULTRAPOWER OF SELF-ADJOINT
OPERATORS

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Abstract: Let $\omega \in \beta\mathbb{N} \setminus \mathbb{N}$ be a free ultrafilter on \mathbb{N} . It is known that there is a difficulty in constructing the ultrapower of unbounded operators. Krupa and Zawisza gave a rigorous definition of the ultrapower A_ω of a self-adjoint operator A . In this note, we give an alternative description of A_ω and the Hilbert space $H(A)$ on which A_ω is densely defined. This provides a criterion to determine a representing sequence $(\xi_n)_n$ of a given vector $\xi \in \text{dom}(A_\omega)$ which has the property that $A_\omega \xi = (A\xi_n)_\omega$ holds. An explicit core for A_ω is also described.

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