

REDUNDANT DECOMPOSITIONS, ANGLES BETWEEN SUBSPACES AND OBLIQUE PROJECTIONS

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Abstract

Let \mathcal{H} be a complex Hilbert space. We study the relationships between the angles between closed subspaces of \mathcal{H} , the oblique projections associated to non direct decompositions of \mathcal{H} and a notion of compatibility between a positive (semidefinite) operator A acting on \mathcal{H} and a closed subspace \mathcal{S} of \mathcal{H} . It turns out that the compatibility is ruled by the values of the Dixmier angle between the orthogonal complement \mathcal{S}^\perp of \mathcal{S} and the closure of $A\mathcal{S}$. We show that every redundant decomposition $\mathcal{H} = \mathcal{S} + \mathcal{M}^\perp$ (where redundant means that $\mathcal{S} \cap \mathcal{M}^\perp$ is not trivial) occurs in the presence of a certain compatibility. We also show applications of these results to some signal processing problems (consistent reconstruction) and to abstract splines problems which come from approximation theory.

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Key words. Oblique projections, angles between subspaces, compatibility, abstract splines.

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