Admissible Factorizations of Hankel Operators Induce Well-Posed Linear Systems

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One of the basic axioms of a well-posed linear system says that the Hankel operator of the input-output map of the system factors into the product of the input map and the output map. Here we prove the converse: every factorization of the Hankel operator of a bounded causal time-invariant map from L^2 to L^2 which satisfies a certain admissibility condition induces a stable well-posed linear system. In particular, there is a one-to-one correspondence between the set of all minimal stable well-posed realizations of a given stable causal time-invariant input-output map (or equivalently, of a given H^∞ transfer function) and all minimal stable admissible factorizations of the Hankel operator of this input-output map.