Building Space-Time Covariance Functions Through Quasi-Arithmetic Means

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The theory of quasi-arithmetic means is a powerful tool in the study of covariance functions across space-time.
We make use of quasi-arithmetic functionals to make inferences about the permissibility of averages of functions that are not, in general, permissible covariance functions. This is the case, e.g., of the geometric and har- monic averages, for which we obtain permissibility criteria. Also, some important inequalities involving covariance functions and preference relations as well as algebraic properties can be derived by means of the proposed approach.
The general results are shown to study spatial and spatiotemporal random fields. In particular, we discuss the representation and smoothness properties of a weakly stationary random field with a quasi-arithmetic covariance function. We use quasi-arithmetic functionals to generalise existing results concerning the construction of nonstationary spatial covariances and discuss the applicability and limits of this generalisa- tion. Several examples of new families of stationary covariances obtainable with this procedure are shown.

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