Mathematics > Operator Algebras

The Super Operator System Structures and their applications in Quantum Entanglement Theory

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(Submitted on 12 Jul 2011)

An operator system $\cl S$ with unit e, can be viewed as an Archimedean order unit space $(\cl S,\cl S^+,e)$. Using this Archimedean order unit space, for a fixed $k\in \bb N$ we construct a super k-minimal operator system OMIN$_k(\cl S)$ and a super k-maximal operator system OMAX$_k(\cl S)$, which are the general versions of the minimal operator system OMIN$(\cl S)$ and the maximal operator system OMAX$(\cl S)$ introduced recently, such that for $k=1$ we obtain the equality, respectively. We develop some of the key properties of these super operator systems and make some progress on characterizing when an operator system $\cl S$ is completely boundedly isomorphic to either OMIN$_k(\cl S)$ or to OMAX$_k(\cl S)$. Then we apply these concepts to the study of k-partially entanglement breaking maps. We prove that for matrix algebras a linear map is completely positive from OMIN$_k(M_n)$ to OMAX$_k(M_m)$ for some fixed $k\le \min(n,m)$ if and only if it is a k-partially entanglement breaking map.

Comments:	32 pages
Subjects:	**Operator Algebras (math.OA)**; Functional Analysis (math.FA)
DOI:	10.1016/j.jfa.2011.11.009
Cite as:	**arXiv:1107.2366 [math.OA]**
	(or **arXiv:1107.2366v1 [math.OA]** for this version)

Submission history

From: Blerina Xhabli [view email]
[v1] Tue, 12 Jul 2011 18:33:00 GMT (26kb)

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