Accepted Manuscript

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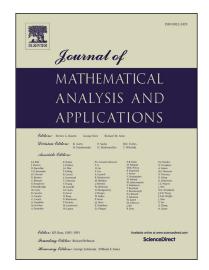
Please cite this article in press as: B. Kuzma, T. Petek, Maps preserving unitarily invariant norms of Jordan product of matrices, *J. Math. Anal. Appl.* (2017), http://dx.doi.org/10.1016/j.jmaa.2017.06.043

Maps preserving unitarily invariant norms of Jordan product of matrices

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Abstract

Surjective isometries in a given unitarily invariant norm on n–by–n complex matrices and with respect to Jordan product, are classified. Moreover, the similar problem is considered for a much wider class of unitarily invariant functions.

Keywords: Matrix algebra, Unitarily Invariant Function, Jordan Product, Surjective Preserver.
2010 MSC: 15A60, 15A86, 15A30

In memory of Leiba Rodman.

1. Introduction

A classical Mazur-Ulam [1, 2] theorem states that on a normed real vector space, a surjective isometry is an affine map (see also Väisälä [3] for a short proof). This important result can be generalized in different aspects. For finite-dimensional normed real spaces or for strictly convex normed real spaces the surjectivity assumption is redundant (see Charzyński [4] or Bhatia and Šemrl [5]). One may consider also approximate isometries [6] (see also [7] and references therein for general solution). More on isometries on matrix spaces with respect to unitarily invariant norms can be found in a paper Chan, Li, Sze [8]. We refer also to Li [9] for a general discussion about the importance of isometries.

On the other hand, on (matrix) algebras one may consider also isometries with respect to operations different from subtractions. One motivation behind

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