

Algebraic properties of isometries on structures of linear operators

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A classical theorem due to Mazur and Ulam (1932) says that every surjective isometry (distance preserving map) between real normed spaces is automatically affine, i.e., it respects the operation of affine combinations. This implies that real normed spaces which are isomorphic merely as metric spaces are also isomorphic as algebraic structures, namely, as linear spaces.

In this talk we present results on the algebraic properties of surjective isometries in the much more general setting of groups and their certain substructures. In particular, we describe all surjective isometries of the unitary group of a complex Hilbert space under a general class of norms and also determine the surjective isometries of the space of all positive definite operators under the geodesic distance (or Thompson metric).

Essential part of the work we are going to report on is joint with O. Hatori, G. Hirasawa, T. Miura and P. Šemrl.

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