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PERTURBATIONS OF NORMS ON C^1-FUNCTION SPACES AND ASSOCIATED ISOMETRY GROUPS

KAZUHIRO KAWAMURA

Abstract. We study some families of norms and isometry groups on $C^1([0,1])$ and $C^1(\mathbb{T})$, the spaces of all complex-valued C^1-functions on the unit interval $[0,1]$ and the unit circle $\mathbb{T}$, with the C^1-topology. The norms studied in the present paper are all equivalent, while their isometry groups are rather different. "Contiuous interpolations" among these norms are introduced and perturbations of the associated isometry groups are studied.

1. Introduction and Preliminaries

The present paper deals with isometry groups associated with norms defined on C^1- function spaces. Two equivalent norms $\|\cdot\|_0$ and $\|\cdot\|_1$ on a continuous function space $F(X)$ over a compact Hausdorff space X may have rather different isometry groups. As an attempt to understand how they are similar or different, and how they are related with each other, we consider a "continuous path" $(\|\cdot\|_t)_{0\le t\le 1}$ of norms on $F(X)$ and study how the isometry groups $\mathcal{U}_t$ with respect to $\|\cdot\|_t$ "vary along the path." For example we may ask the following question.

Question 1 ([6]). Let T be an isometry with respect to $\|\cdot\|_0$. Does there exists a "continuous collection" $(T_t)_{0\le t\le 1}$ of linear operators such that $T_0 = T$ and T_t is a $\|\cdot\|_t$-isometry for each $t \in [0,1]$?

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