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REGULARITY OF COMMUTER FUNCTIONS FOR HOMEOMORPHIC DEFECT MEASURE IN DYNAMICAL SYSTEMS MODEL COMPARISON

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Abstract. In the field of dynamical system, conjugacy describes an equivalent relation between two dynamical systems. In our work, we are dealing with mostly conjugacy, which relates two dynamical systems that are not necessarily conjugate. We generate a function called "commuter" based on a fixed point iteration scheme. The resulting "commuter" is a nonhomeomorphic change of coordinates translating between two systems. And we can determine the amount of failing to be conjugacy, which we call homeomorphic defect, by studying the properties of commuters.

We consider the function space $L^p[0,1]$, with $1 \leq p < \infty$, and the norm is given by the standard L^p norm. We derive a contractive operator which will give a limit point from the commuting relationship even when applied to nonconjugate systems. We discuss the measurability of commuters. Specially, when studying behaviors of commuters between full symmetric tent map and short symmetric tent map, we show that the commuter is monotonely convergent to identity function as the height of the short one is going to 1. At last, we also give a computation error analysis for our computation method in producing commuters.

Keywords. mostly conjugacy, commuter function, fixed point iteration, L^p space, tent map

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1 Introduction

Modeling is a fundamental problem whereby we seek to represent a system or data's behaviors. To the extent that science seeks to codify knowledge of the world, a basic tool in science is the model - a simplified representation of the "true" system under consideration, with mathematical models being a particular example. An essential question within this modeling context is "how close is the model to the true phenomena." Where the natural system under consideration is dynamic, with possibly complex behavior, the field of dynamical systems seeks to provide an appropriate framework for study of