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Department of Mathematics
Faculty of Science
Tanta University

SOME GEOMETRIC TRANSFORMATIONS ON MANIFOLDS AND THEIR ALGEBRAIC STRUCTURES

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By

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Submitted for the Degree of Doctor of Philosophy in Science

(Pure Mathematics)

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PREFACE


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One of the main techniques of algebraic topology is to study topological spaces by forming algebraic images of them. Most often these algebraic images are groups, but more elaborate structures such as rings, modules, and algebras also arise. The mechanisms which create these images the 'lanterns' of algebraic topology, one might say are known formally as functors and have the characteristic feature that they form images not only of spaces but also of maps. Thus, continuous maps between spaces are projected onto homomorphisms between their algebraic images, so topologically related spaces have algebraically related images.

To show that two spaces are not homeomorphic involves showing that such a map does not exist. To do this is often harder as an algebraic means to tackle such problem , Bet associated with each topological space a certain sequence of a group called its fundamental group .

As the title of this thesis suggests we are concerned with extending the folding and unfolding of manifolds to a folding and unfolding of a fundamental groups. The relations between the folding , retraction and the deformation retract on the fundamental group are discussed . Some types of conditional foldings and unfoldings restricted on the elements of the fundamental groups are deduced.

The thesis consists of five chapters:

Chapter One is an introduction and presents a brief survey of the main important definitions that help us to follow up this work.

In Chapter Two we introduce the results of some geometric transformations of the manifold on the fundamental group. Some types of deformation retracts of the manifold will be discussed. The chain of foldings and chain of unfoldings will deduce a chains of fundamental groups . We introduce the concept of unfolding on the fundamental group. The folding on a wedge sum of some types of manifolds which are determined by their

fundamental group are obtained. Some types of conditional foldings restricted on the elements of the fundamental groups are deduced. The effect of retraction of manifolds on the fundamental group is obtained. The folding of variation curvature of manifolds on their fundamental group are presented.

The results in this chapter are accepted for publication in the journal of advanced studies in contemporary mathematics, Korea [27].

In Chapter Three we discuss the fundamental group of the folding on some types of manifolds. The relations between the folding and the deformation retract on the fundamental group are discussed. The fundamental group of the folding and unfolding on the non-athwart-immersed spheres is obtained. Also, the folding and unfolding on the connected sum of some types of manifolds which are determined by their fundamental group are deduced . Some applications in manufacturing are presented.

The results in section (3.2) of this chapter are accepted for publication in the Journal of Differential geometry-Dynamical systems, Romania [28]. Also we published the results in section (3.3) of this chapter in the Journal of the Chungcheong Mathematical Society, Korea [26] .

In Chapter Four we introduce free fundamental groups of some types of manifolds. Some types of conditional foldings restricted on the elements on free group and their fundamental groups are deduced. Also, the fundamental group of the limit of foldings on a wedge sum of two manifolds is obtained. The concept of foldings will be discussed from viewpoint of algebra. The effect of foldings on a manifold M or on a finite number of product manifolds $M_1 \times M_2 \times \cdots \times M_n$ on the fundamental group $\pi_1(M)$ and $\pi_1(M_1 \times M_2 \times \cdots \times M_n)$ are presented. Moreover, we discuss the fundamental group of the limit of foldings of the Cartesian product of manifolds into itself. Theorems governing these relations are achieved.

The results in section (4.2) of this chapter are accepted for publication in the Journal of Applied Mathematical Science, India [30]. Also we

published the results in section (4.3) of this chapter in the Journal of Applied Sciences, Romania [31] .

In Chapter five we introduce the definition of a new type of the fundamental group called chaotic fundamental group. Some types of conditional foldings and unfoldings restricted on the elements of the chaotic fundamental groups are obtained. Also the chaotic fundamental groups of the limit of foldings are deduced. The variant and invariant of the chaotic fundamental group under the folding of chaotic manifold into itself are presented. Theorems and corollaries governing these studies are achieved. The results of some geometric transformations of the manifolds on the factor group are discussed. Some types of conditional foldings and unfoldings of elements on the factor group are deduced.

The results in section (5.2) of this chapter are accepted for publication in the Journal of applied mathematics and computing, Korea, [32]. And the results in section (5.3) of this chapter are accepted for publication in International journal of Pure and Applied Mathematics, Bulgaria [29].

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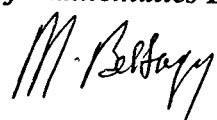

Prof. Dr.M.Beltagy