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لم ترد بالاصل

DEFORMATIONS OF GENERALIZED HYPERRULED SURFACES AND THEIR STABILITY IN THE EUCLIDEAN SPACE E^{n+1}

A THESIS

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"بســم اللـــه الــرحمن الـرحيـــم "

"..... وعلمك ما لم تكن تعلم وكان فضل الله عليك عظيما . "

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Hamdy Nour El-Din Abd-Ellah

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PREFACE

PREFACE

One of the problems of differential geometry is the investigation of manifolds whose generating element is a line in the space being considered.

At the end of the 19th century and in the first half of the 20th century the **differential geometry of families of lines** (the geometry of manifolds of figures) was developed mainly within classical geometry; here were considered families of elementary lines.

The differential geometry of line manifolds (ruled surfaces, line congrunces and line complexes) of a three-dimensional space is one of the important branches of differential geometry since it is directly connected with the foundation of this science which is the theory of surfaces. It has direct applications to various applied sciences as hydrodynamics, geometrical optics and field theory. Also it has many applications which are treated in many different branches, for instance, classical, local, global, algebraic and Kinematic study view. This topic was studied by several authors on different types of spaces such as, Euclidean, Elliptic, Hyperbolic, isotropic, flaggen, quasihyperbolic, projective spaces, etc. During this time many general and special results have been obtained on the basis of which there have arisen a number of theories generalizing the simplest three-dimensional constructions and extending then to multidimensional spaces.

The rise of new differential-geometric methods permits us each time to state previously obtained results more simply and concisely, to solve some problems which did not yield to older methods, and to pose new problems whose analyses in their own turn stimulate the appearance of new methods. The application of tensor methods in differential line geometry, connected wtih the idea of "translation "i.e., the mapping of a set of straight lines of a three-dimensional space onto some point space.

One of the most interesting and profound aspects of classical **differential geometry** is its interplay with the **calculus of variations**.This phenomenon has its roots in the very origins of the subject, such as, for instance, in the theory of minimal surfaces. More recently, the variational principles which give rise to the field equations of the general theory of relativity have suggested the systematic investigation of a seemingly new type of variational problem. In the case of the earlier applications one is, at least implicitly, concerned with a multiple integral in the calculus of variations whose Lagrangian depends on the projection factors of some subspace, these projection factors being obtained by differentiation of the functions which appear in the parametric equations by means of which the subspace is represented; the corresponding Euler-Lagrange equations are supposed to yield appropriate functions of this kind. The variational problems of the second type referred to above are defined by Lagrangians whose arguments are the components of the metric tensor of a manifold, together with the first and second derivatives of these components, and the resulting Euler-Lagrange equations give rise to the required metric.

Also, the most important geometric variational integrals are given by area (or volume), energy, and curvature integrals. Critical points of area integrals are minimal surfaces and their higherdimensional generalizations, critical points of energy integrals are called harmonic maps, and curvature integrals usually select special metrics or connections. In any case, the basic idea is to select a geometrically most natural representative from a general class of objects (submanifolds, mappings, metrics, etc.) via a variational procedure. Often, one can deduce special properties of such an object from the fact that it is a minimum or a critical point of a variational problem, and one can then in turn use this information to obtain information about the whole geometric class.The area functional and its critical points, the minimal sufaces, were already intensively studied in the last century. While many interesting examples were found and many geometric properties of minimal surfaces were discovered during that period.

In fact, the main differential geometric ideas of the calculus of variation occur over and over again and are continually being invented and rediscovered in a vast array of classical and modern differential geometry.

Here, we give a brief account of the history of the results related to the problems in the thesis which have been obtained previously as follows:

In 1973, Chen [17]; generalized the formulas concerning the stability of surfaces which are introduced by **Pinl and Trapp [49] and Thomsen [62].**

In 1978, Chariar [21]; determined ruled Wiengarten surfaces and found that the line of striction of the generators must be a right circular helix, circle included, or a straight line and the parameter of distribution must be constant.He also, obtained the functional relation between the mean and Gaussian curvatures.

In 1978, Thas [61]; gave some results of the Lipschitz-Killing curvature and the mean curvature vector H of 2-dimensional ruled surfaces in E^n.The ruled surfaces with minimal Lipschitz-Killing curvature in the direction of H are studied. The scalar normal curvature and the minimal index are also investigated.