Texas Tech University - Department of Mathematics and Statistics
Seminar in Applied Mathematics

Obtaining New Classes of Surfaces Using Integrable Equations

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ABSTRACT. There are some special subclasses of 2-surfaces which arise in various parts of mathematics such as Willmore surfaces, Willmore-like surfaces, surfaces solving the shape equation of lipid membrane, and surfaces solving the generalized shape equation. However, in order to obtain these surfaces a highly nonlinear differential equation needs to be solved which is quite difficult in general. We use an alternative approach. We develop surfaces using integrable equations such as Korteweg-de Vries (KdV), modified Korteweg-de Vries (mKdV), Nonlinear Schrdinger (NLS), Sine Gordon (SG) equations. The relation between surfaces and integrable equation is established by the use of Lie groups and Lie algebras. In this talk, we present construction 2-surfaces from NLS equation using spectral parameter deformation. These surfaces contain a family Weingarten and Willmore-like surfaces. We show that some NLS surfaces solve the generalized shape equation which is derived from a variational principle. We also give a method for constructing the position vectors of NLS surfaces by using soliton solution of NLS equation. We also present the graph of interesting NLS surfaces.