



HACETTEPE ÜNİVERSİTESİ MATEMATİK BÖLÜMÜ GENEL SEMİNERİ

(HACETTEPE UNIVERSITY MATHEMATICS GENERAL SEMINAR)

Tarih (Date) : 23.12.2015, Çarşamba (Wednesday)

Saat (Time): 15:00

Yer (Place): Yaşar ATAMAN Seminer Salonu

Konuşmacı (Speaker): Ayhan Aydın (Atılım University)

Başlık (Title): Three conservative schemes for the 3-coupled nonlinear Schrödinger equation

Özet (Abstract): The N-coupled nonlinear Schrödinger (N-CNLS) equation arises as the governing model equation in several branches of physics including, for example, optics, fluid dynamics, quantum mechanics and biophysics. In the last decades, there has been an increased interest in numerical preservation of one or more physical/geometric properties of the mechanical system under consideration. There has been a lot of works on the numerical solution of the single NLS and the coupled NLS (2-CNLS) equation such as symplectic and multisymplectic schemes, the Hopscotch method, Galerkin finite element method, a fourth-order explicit Runge-Kutta method, and so on. Recently, the main attention for the 2-CNLS equation is the mass and the energy preserving schemes. Although, there are many numerical studies on the NLS and the 2-CNLS, numerical studies for N-CNLS equation with $N \geq 3$ are rare. In this study, 3-CNLS is considered. In particular, three conservative schemes are proposed; namely, (i) a scheme that conserves the energy, (ii) a linearly implicit three-level scheme that conserves the mass, and (iii) a two-level scheme that conserves both the mass and the energy of the 3-CNLS equation. Many numerical results are carried out to test the efficiency and reliability of the proposed schemes. The numerical results show that the proposed schemes have excellent performance in simulating the plane wave, periodic, single and colliding soliton solutions of the 3-CNLS equation during long-time integration.

Acknowledgments: This work is supported by The Scientific and Technological Research Council of Turkey (TUBITAK) with the project number 114F020.

PS: It is a joint work with Sevim Ertuğ (M.Sc. Student, Math.Dept, Atılım University)