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Mohammad Shazri Shahrir is the Head of Analytics and Computation at Telekom Malaysia R&D. He specializes in Machine Learning and Numerical Methods. Mohammad Shazri graduated in 2005 with Bachelor of Engineering in Electrical and Electronics from University of Nottingham and now pursuing his Masters in Mathematics at the University of Malaya. Previously he was the Head of Research and Development in Extol MSC Berhad where he was one of the founding members of the Artificial Intelligence Lab. Among many products that he led, a noteworthy achievement of this lab, its success to research, develop and commercialize a Face Verification System that was later implemented in Iran. Mohammad Shazri currently is the Technical Lead for Big Data Research Project in TM R&D that looks into enabling Big Data to find insights and solve Network related issues in TM.

Title

Interesting Applications of Neuro Method: Application to Solving Initial Value Problem (IVP) Ordinary Differential Equations (ODE).

Abstract

Differential equations play a major role in the solution of problems in the physical world. In particular, systems of differential equations are prominent in the field of Quantum Scattering (QS) theory. Traditional numerical methods such as Runge-Kutta, Adam-Bashforth, Euler and many more others have always been used in numerical treatment of ODEs. These numerical schemes have been successfully used with the availability of increasing computer power. But there are many challenges in using these methods to find more accurate solutions. Today, there is a growing trend to develop nontraditional approaches such as neural networks and others to obtain accurate numerical solutions of these ODEs. Other disadvantages of traditional ODE methods (Euler's Method, Taylor Series Method, Runge Kutta Methods, Multi-Step Methods) are (1) the need of explicit form of derivatives of f and (2) problems where there is varying gridsize and there is a need of stepsize. Through the course of this Study, Neural Network Integration (NNI) has also been applied to other problems for example Optimal Control Theory. In optimal control theory solving the Riccati differential equations is vital to achieve optimal control. Solutions that can be produced from the Riccati equation is well posed as shown by Chen et. al these solutions are produced from stochastic linear quadratic regulator problems. Results in this paper shows that by solving via Neuro methods, an optimal feedback control solution can be obtained. Non-traditional methods unto First Order Differential Equation (FODE) were also investigated. Problems that was applied to were Tumor Growth, Electric Circuits and Falling Bodies. Second Order Differential Equations (SODE) in Quantum Scattering systems namely using the method of Neural Network Integration (NNI) that has shown promising results for First Order Differential Equations (SODE). The project will simulate numerically via different numerical methods from a class of Runge-Kutta (RK) schemes to NNI method and to analyze its statistical deviations from real experiments. Further improvement of NNI was also investigated in the proposed method. This proposed method goes by the name "A Multiagent Transfer Function Neuroapproach to Solve Fuzzy Riccati Differential Equations" by shazri et al. where the complexity of the solver (degree of polynomial) can be controlled.