Accepted Manuscript

A new spectral problem and the related integrable nonlinear evolution equations

Xiao Yang, Dianlou Du

PII: S0893-9659(17)30255-0
DOI: http://dx.doi.org/10.1016/j.aml.2017.08.010
Reference: AML 5318

To appear in: *Applied Mathematics Letters*

Received date : 4 July 2017
Revised date : 17 August 2017
Accepted date : 17 August 2017

Please cite this article as: X. Yang, D. Du, A new spectral problem and the related integrable nonlinear evolution equations, Appl. Math. Lett. (2017), http://dx.doi.org/10.1016/j.aml.2017.08.010

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

*Manuscript
Click here to view linked References

A new spectral problem and the related integrable nonlinear evolution equations

Xiao Yang* and Dianlou Du**

School of Mathematics and Statistics, Zhengzhou University, Zhengzhou, Henan 450001 PR China

E-mail:*yx@zzu.edu.cn, **ddl@zzu.edu.cn,

Abstract

A new spectral problem is introduced, which is indicated to be the negative counterpart of the mKdV spectral problem. Based on the fact, some integrable nonlinear evolution equations are obtained, including the derivative Schwarzian KdV equation, the mKdV5 equation and the sine-Gordon equation. Besides, Lax pairs and finite genus solutions of the equations are given.

PACS: 02.30.Jr; 02.30.Ik; 04.20.Jb.

Keyword: spectral problem, integrable nonlinear evolution equation, Lax pair, finite genus solution.

1 Introduction

Integrable nonlinear evolution equations (NEEs) play an important role in mathematics and physics. An effective approach to study such equations is to treat them as the hierarchies yielded from spectral problems. The idea originated from 1968, in the paper of Lax, a KdV hierarchy was provided [1]. Then in 1970s, Zakharov and Shabat, Ablowitz, Kaup, Newell and Segur, developed the inverse scattering transform method to study NEEs as a hierarchy in a wider context [2,3]. Till now, many famous examples have been presented; for instance, the Camassa-Holm hierarchy [4], the Kaup-Newell hierarchy [5] and the Ablowitz-Ladik hierarchy [6].

And it is worth mentioning that members of a hierarchy share the common features: Lax representations, conservation laws, bi-Hamiltonian structures, etc. In view of this, finding suitable spectral problems is of great significance in the discussion of integrable NEEs.

In the present paper, we will introduce a new spectral problem written as

$$\chi_y = V_{-1}\chi, \quad V_{-1} = \begin{pmatrix} 0 & \lambda^{-1}s^{-1} \\ \lambda^{-1}s & 0 \end{pmatrix}, \quad \chi = \begin{pmatrix} \chi_1 \\ \chi_2 \end{pmatrix}, \tag{1.1}$$

which will be proved to be the negative counterpart of the mKdV spectral problem

$$\chi_x = V_1\chi, \quad V_1 = \begin{pmatrix} u & \lambda \\ \lambda & -u \end{pmatrix}, \quad \chi = \begin{pmatrix} \chi_1 \\ \chi_2 \end{pmatrix}. \tag{1.2}$$

Download English Version:

https://daneshyari.com/en/article/5471511

Download Persian Version:

https://daneshyari.com/article/5471511

Daneshyari.com