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SOLITONS INTERACTIONS OF A TRIAD AND A QUADRUPLET OF THE KADOMTSEV-PETVIASHVILI EQUATION

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Abstract. The two-dimensional form of the Korteweg-de Vries equation is given by the Kadomtsev-Petviashvili (KP) equation. The KP equation can be solved by Hirota bilinear method. The traditional group-theoretical approach can generates analytic solutions of soliton because the KP equation has infinitely many conservation laws. Two-soliton solutions of the KP equation yield a triad, quadruplet and a non-resonant soliton structures in soliton interactions. From these basic resonant structures, higher number of soliton interaction could be observed. This paper concentrates on one type of the four-soliton solutions of the KP equation that is the interaction of a triad and a quadruplet. The solution of the interaction and interaction patterns are shown in this paper.
Keywords. Kadomtsev-Petviashvili equation; Hirota bilinear method; quadruplet; triad; soliton.
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1 Introduction

The Kadomtsev-Petviashvili (KP) equation is also known as the two-dimensional form of the Korteweg-de Vries (KdV) equation. Kadomtsev and Petviashvili [3] derived the KP equation in 1970 while examining the stability of the one-soliton solution of the KdV equation under transverse perturbations. Miles [4], [5] discovered that the interaction region between the incident solitons and the centered-shifted solitons in two-soliton interaction is essentially itself a single soliton. Miles named the interaction soliton as resonant soliton, which is associated with two incident solitons.

There are three types pf resonant structures in two-soliton interaction of the KP equation, namely a triad, quadruplet and a cross, [6], [8], [9]. From these basic resonant structures, the interaction of higher number of soliton of the KP equation could be observed. This paper focuses on one of the