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Revisiting the Inhomogeneously Driven sine-Gordon Equation

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Abstract

The sine-Gordon equation is a semilinear wave equation used to model many physical phenomenon like seismic events that includes earthquakes, slow slip and after-slip processes, dislocation in solids *etc.* Solution of homogeneous sine-Gordon equation exhibit soliton like structure that propagates without change in its shape and structure. The question whether solution of sine-Gordon equation still exhibit soliton like behavior under an external forcing has been challenging as it is extremely difficult to obtain an exact solution even under simple forcing like constant. In this study solution to an inhomogeneous sine-Gordon equation with Heaviside forcing function is analyzed. Various one-dimensional test cases like *kink* and *breather* with no flux and non-reflecting boundary conditions are studied.

Keywords: In-homogenous sine-Gordon equation, soliton, Heaviside forcing, Kink, Breather.

1. Introduction

The sine-Gordon (sG) equation is a nonlinear hyperbolic partial differential equation which was first introduced in the theory of differential geometry. There are various physical processes governed by sG equation. In [1] it is found that
5 the process of propagation of dislocation in crystal is governed by sG equation

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