

# Supratransmission-induced discrete rogue wave in nonlinear chain

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**Abstract**—We numerically generate a discrete rogue wave in a chain of a nonlinear pendulum using the nonlinear supratransmission way and the instability of shaken pendulum. This could open the way for the application of discrete rogue waves within simple devices.

## 1. Introduction

Since the pioneering work by Geniet and Léon [1] on the nonlinear supratranmission phenomenon, the behavior of the plane wave in the forbidden band has fascinated several researchers. Nowadays, the nonlinear supratransmission phenomenon appears to be a way to generate travelling solitons such as symmetric (asymmetric) breather [2] and kink [3] to mention a few. Can rogue waves be generated by a nonlinear band gap transmission way? Answer this question is the aim of this work.

## 2. Mathematical description of the model

Let us consider the equation of motion of the nth pendulum in the form[4, 5]:

$$\ddot{\theta}_n - c(\theta_{n+1} + \theta_{n-1} - 2\theta_n) + \sin(\theta_n) + f\omega^2 \cos(\omega \tau) \cos(\theta_n) = 0,$$
(1)

The numerical simulation of equation (1) submitted to the periodically driven edge and parametric excitation is given in figure 1.

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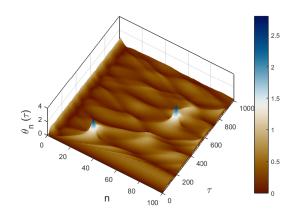


Figure 1: f=0.026; c=1;  $\omega = 0.95 rad. s^{-1}$ .

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