

# Supratransmission-induced discrete rogue wave in nonlinear chain

Alain Bertrand Togueu Motcheyo<sup>1</sup>, Masayuki Kimura<sup>2</sup>, Yusuke Doi<sup>3</sup>, Juan F. R. Archilla<sup>4</sup>

<sup>1</sup> Department of Mechanical Engineering, Higher Technical Teacher's Training College (ENSET) Ebolowa, University of Ebolowa, P.O. Box 886, Ebolowa-Cameroon

<sup>2</sup> Department of Electrical and Electronic Engineering, Faculty of Science and Engineering, Setsunan University, Japan

<sup>3</sup> Department of Mechanical Engineering, Graduate School of Engineering, Osaka University 2-1 Yamadaoka, Suita, Osaka 565-0871, Japan

<sup>4</sup> Group of Nonlinear Physics, Universidad de Sevilla, ETSI Informtica, Avda Reina Mercedes s/n, 41012-Sevilla, Spain

Email: alain.togueu@univ-yaounde1.cm, masayuki.kimura@setsunan.ac.jp, doi@mech.eng.osaka-u.ac.jp, archilla@us.es

**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 supratransmission 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  $n$ th pendulum in the form[4, 5]:

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

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

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ORCID iDs ABTM: 0000-0002-6918-9281, MK: 0000-0002-1445-6266, YD: 0000-0003-3749-5353, JFRA: 0000-0001-6583-6114

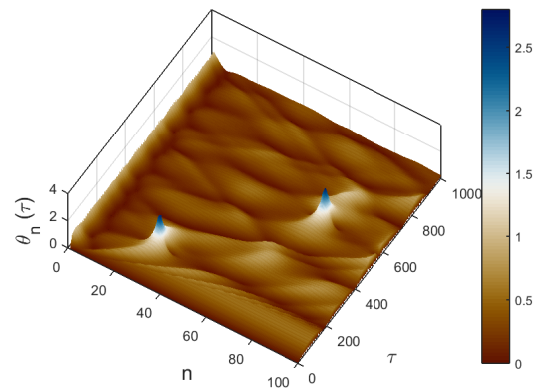


Figure 1:  $f=0.026$ ;  $c=1$ ;  $\omega = 0.95 \text{ rad.s}^{-1}$ .

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