

Visualization of topological edge modes in mechanical graphene

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Abstract

abstract

1 Introduction

2 Formulation

2.1 1D mechanical lattice on inertial frame of reference

Before breaking TRS by introducing Coriolis force on the non-inertial reference frame, we want to check how the system works on the inertial frame of reference for comparison.

$$m\ddot{\xi}^n = -2k\xi^n + k\eta^n + k\eta^{n-1} \quad (1)$$

$$\ddot{\xi}^n = \frac{k}{m}(-2\xi^n + \eta^n + \eta^{n-1}) \quad (2)$$

$$-\omega^2\xi^n = \omega_0^2(-2\xi^n + \eta^n + \eta^{n-1}) \quad (3)$$

with

$$\xi = Ce^{i\omega t} \quad (4)$$

$$\omega_0^2 = \frac{k}{m} \quad (5)$$

By repeating same process on η we can get the following result.

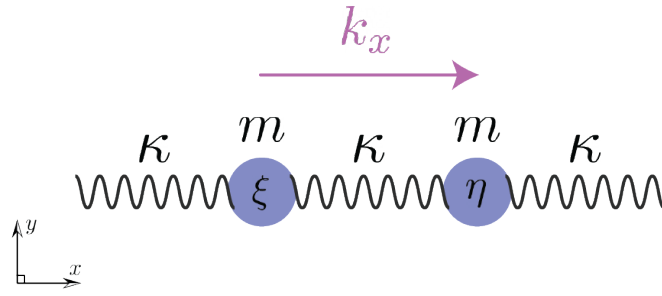
$$-\omega^2\eta^n = \omega_0^2(-2\eta^n + \xi^n + \xi^{n-1}) \quad (6)$$

and by defining bloch's constant with $K = e^{ik}$

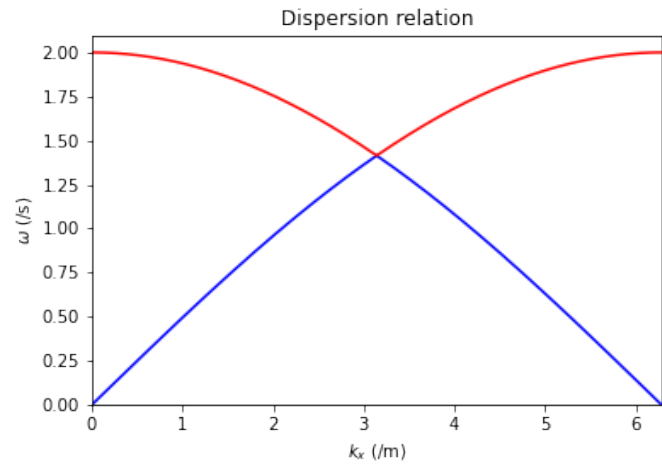
$$K = e^{ik}$$

2.1.1 Exact model

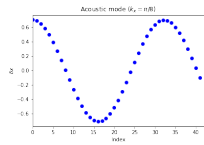
We don't need to use exact model like fig because wavenumber propagates through tangential direction does not have measurable effect on overall dispersion relation.



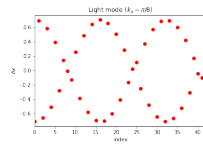
(a) 1a



(b) 1b



(c) 1c



(d) 1d

Figure 1: plots of....

2.2 1D mechanical lattice on non-inertial reference frame

2.2.1 With coriolis force

2.2.2 With coriolis force and centrifugal force

2.3 2D mechanical graphene on inertial frame of reference

2.4 2D mechanical graphene on non-inertial reference frame

2.4.1 With coriolis force

2.4.2 With coriolis force and centrifugal force

3 Experiment

3.1 Experimental setup

contents

3.2 1 dimensional mechanical lattice

3.3 2 dimensional mechanical graphene

4 Result

5 Conculsion

6 Further research

References