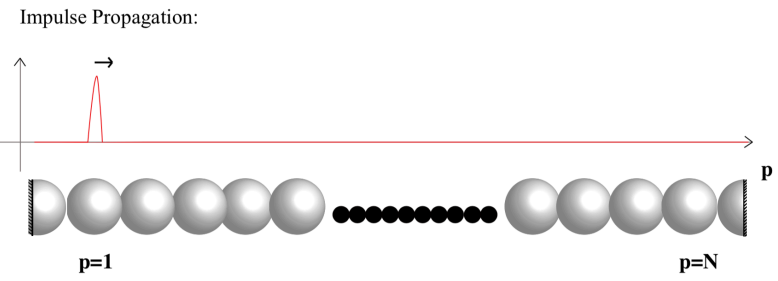
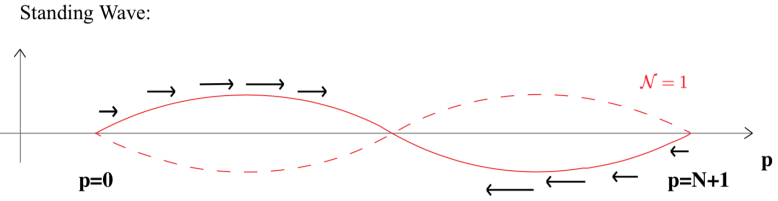
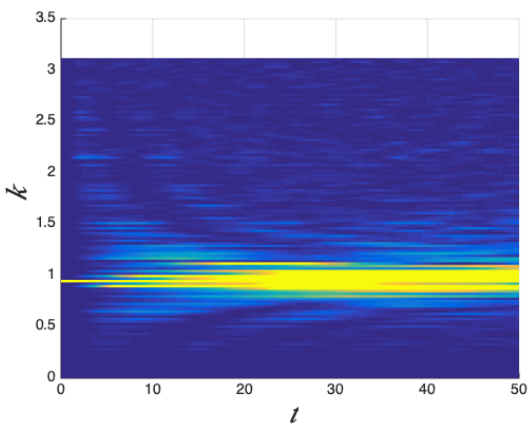
Universität Stuttgart
Institut für Mechanik (Bauwesen)
Lehrstuhl für Kontinuumsmechanik
Prof. Dr.-Ing. H. Steeb

Masterthesis

Energy Propagation in Granular Systems







Total energy response in wavenumber space of a single realization of disordered granular chain.

At the chair of continuum mechanics of the Institute of Applied Mechanics (CE) the following Master thesis is offered in colaboration with Multi-Scale Mechanics, University of Twente,NL.

Motivation: Energy transfer is one of the essentials of mechanical wave propagation (along with momentum transport). The diffusive (scattering) characteristics of energy during wave propagation is focus of many ongoing investigations. Predicting the energy propagation characteristics in real and wavenumber space through disordered (simplfied) model, granular media like chains can assist in understanding the overall properties of wave propagation through real inhomogeneous media like soil; this eventually, can assist in seismic prospecting, non-destructive testing or designing metamaterials.

Goal: The effect of disorder on energy propagation is first examined using an impulse propagating in a disordered granular chain, where disorder is given by the standard deviation of the stiffness distribution of the elements/granules. At first, a Master Equation is developed to analyze the criss-cross transfer of energy across different wavenumbers for a granular 1D-chain. Later, the proposed model is extended for 2D and 3D granular systems.

Tasks:
- Literature review
- To develop a master equation for 2D and 3D particulate systems
- To compare the model with DEM simulations
- Interpretation and discussion of results

Requirements:
- Fundamentals of continuum mechanics and numerical methods
- Interest in theoretical framework
- Basic programming skills, e.g. Matlab

Language:
- English

Contact:

Dr. Kianoosh Taghizadeh
Email: kianoosh.taghizadeh-bajgirani@mib.uni-stuttgart.de