

How to use MATLAB Version of GADIHOM

(This code is provided freely, but if you use it, please cite publication linked with this code : "F. Dos Reis and N. Karathanasopoulos, Inverse metamaterial design combining genetic algorithms with asymptotic homogenization schemes. International Journal of Solids and Structures (2022), doi: <https://doi.org/10.1016/j.ijsolstr.2022.111702>.")

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Introduction

This is the MATLAB version of GADIHOM, a Genetic Algorithm for Inverse HOMogenization¹.

The code is composed with modules :

1. GADIHOM.m : main function module of the genetic algorithm
2. Homogenization.m : asymptotic homogenization module
3. Mesh.m : mesh module
4. Compliance.m : Compute the compliance tensor from mechanics moduli
5. Save_matrix.m : save a matrix in csv format
6. Fcost.m : cost function for the genetic algorithm
7. mechanic_moduli.m : extract mechanic moduli from homogenized compliance tensor

How to use

- modify the data values in a ExampleUsei.m code to call the main function GADIHOM(...)

```
%% data values for example 1
nchromosomes=128; % number of chromosomes (must be 4 factor)
nkeep=64; % number of kept chromosomes
rhov=0.1; % homogenized volumic density target
seed=6; % number of beams per side
nkmax=1000; % number iterations max
% Material properties target
Ex=3000; Ey=3000; Gxy=800; etaxy=0.0; etaxxy=0.0; nuyx=0.0;
target=Compliance(Ex, Ey, Gxy, etaxy, etaxxy, nuyx); % compliance tensor
wtar= [10 10 10 10 10 50]; %weight vector
mutrate=0.05; % mutation rate
ntvalue=1000; % number of different value for beam width t
lambda=2.0; % weight of
convergence=0.003;
nConvergence=50;
GADIHOM(nchromosomes,nkeep,rhov,seed,nkmax,target,wtar,mutrate,ntvalue,...
        lambda,convergence,nConvergence);
```

- Run
- Results are stored in various csv file :
 - Tb.csv : width's beam values of best lattice found. See the appendix in paper to know the store order used

¹ Not all the features are included. A translated fastest and enhanced C code was available.

- Mechanic_homogenized.csv : homogenized mechanic moduli values for best lattice.
Contain : $[K, E_x, E_y, \nu_{yx}, \nu_{xy}, G, \eta_{x,xy}, \eta_{y,xy}, \eta_{xy,x}, \eta_{xy,y}]$
- Other files containing the topology of the lattice