# A TOOLBOX FOR IN SILICO EVALUATION OF MOTION ESTIMATORS FOR THE ARTERIAL WALL

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#### **Background and Motivation**

- Motion analysis of the arterial wall from ultrasound images holds a prominent diagnostic role
- Elucidates the mechanical behavior of the arterial wall Reveals interactions and strains between different regions Discriminates vulnerable atherosclerotic lesions
- The motion estimator is a crucial choice toward valid clinical conclusions and computational efficiency
- The authors have systematically developed an *in silico* evaluation framework

13 computer-generated image sequences that simulate typical and challenging scenarios of real ultrasound image recordings [1, 2]

Purpose: Package the *in silico* evaluation framework in a Matlab Toolbox with user-friendly interfaces 

## Workflow

#### Start National Technical University of Athens Input: medical Simulations and Imaging Laboratory oolbox for In Silico Evaluation of Motion Estimators a motion estimator implemented for the Arterial Wall Step 1: Insert algorithm for evaluation as Matlab function Suidelines: The algorithm should be a Matlab function using the following format: Insert Compatibility Test Algorithm Output: able consisting of the estimated longitudinal positions of the motion targe motion tracking errors (in pixels) 3 )ifferent format will not allow the evaluation of the algorithm Insert algorithm for evaluation

#### **Usage Snapshots**



Benchmarking of motion estimators developed by different research groups



5 <sub>G15</sub>	2.6393	1.4467	2:2075	9.0322
S <sub>SP25</sub>	0.8514	0.4063	0.7482	9.2561
S <sub>SP15</sub>	1.7348	0.5610	1.6417	9.0502
SF	1.9877	0.2694	1.9694	5.1944

### Conclusions

- This work introduced an in-house Matlab Toolbox for evaluating motion estimators for the arterial wall from ultrasound images.
- Advantages of *in silico* evaluation with respect to other approaches:  $\blacktriangleright$  Low-cost ( $\neq$  tissue-mimicking phantoms)
  - $\triangleright$  No need for special equipment ( $\neq$  tissue-mimicking phantoms)
  - $\triangleright$  Quantitative evaluation results ( $\neq$  inspection of real data measurements)
- Limitations:
  - Need for compatibility with Matlab

straightforward comparisons

- Future perspective:  $\bullet$ 
  - Available as a web service to facilitate access and storage of results

#### The presented toolbox can be made available upon request.

#### More details on the simulated image sequences

[1] Gastounioti et al. Phys. Med. Biol. 2013 [2] Golemati et al. IEEE Trans. Inf. Technol. Biomed. 2012

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