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
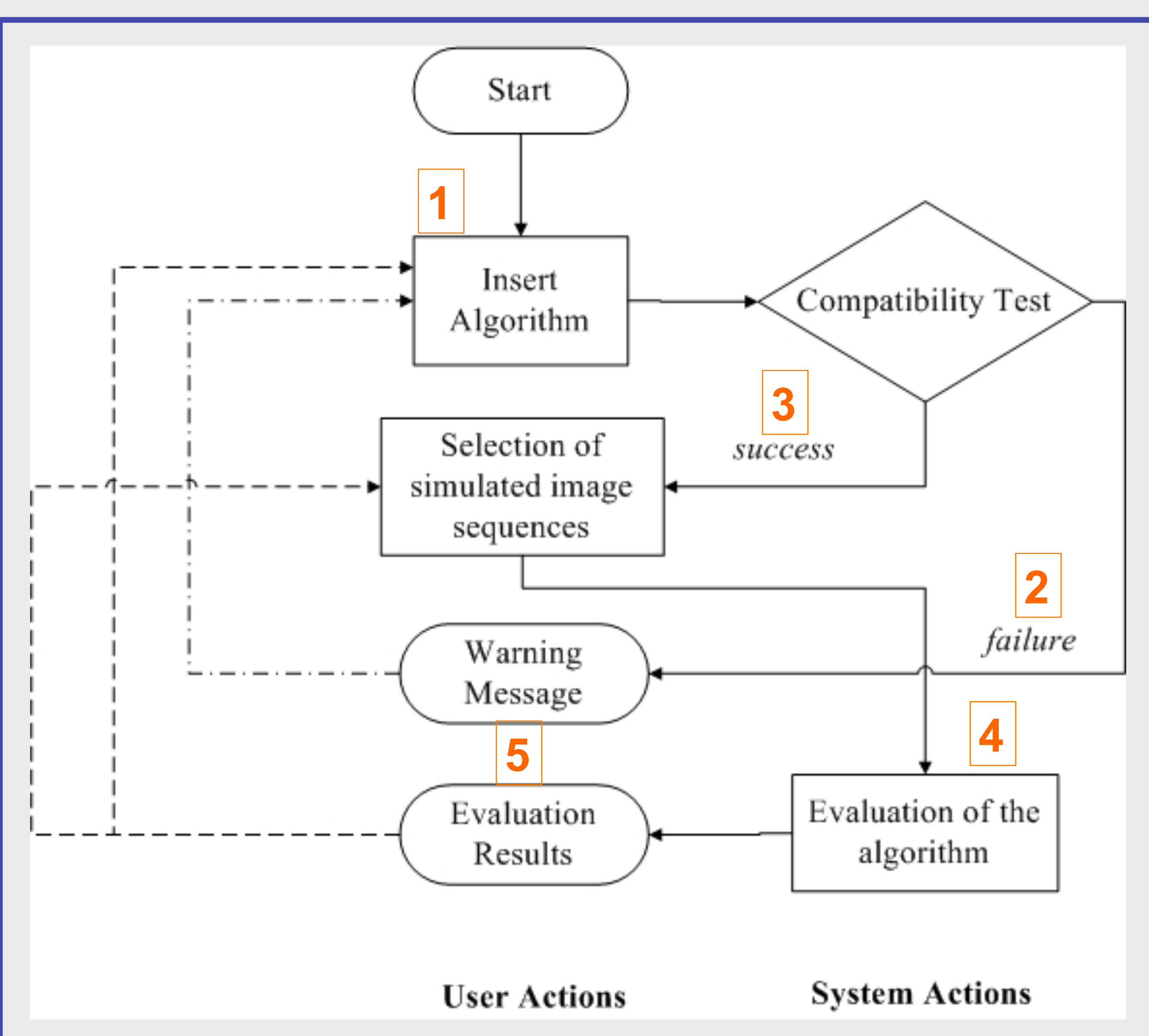
Usage Snapshots

Input:
- a motion estimator implemented as Matlab function

Output:
- motion tracking errors (in pixels)
- computational time (in *s*)

Usage Scenarios

- Evaluate a motion estimator
- Repeat the evaluation procedure
  - optimisation of a motion estimator in terms of its parameterisation
  - comparative evaluation of different motion estimators
- Benchmarking of motion estimators developed by different research groups
  - straightforward comparisons

Conclusions

The presented toolbox can be made available upon request.

- 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:
  - Low-cost ($\neq$ tissue-mimicking phantoms)
  - No need for special equipment ($\neq$ tissue-mimicking phantoms)
  - Quantitative evaluation results ($\neq$ inspection of real data measurements)
- Limitations:
  - Need for compatibility with Matlab
- Future perspective:
  - Available as a web service to facilitate access and storage of results

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

Acknowledgements