Fast shear wavevector estimator for real-time elasticity map reconstruction

Enrique González-Mateo[1], Francisco Camarena[1], Noé Jiménez[1]

[1] Instituto de Instrumentación para Imagen Molecular, CSIC - Universitat Politècnica de València, Spain

Introduction

Background

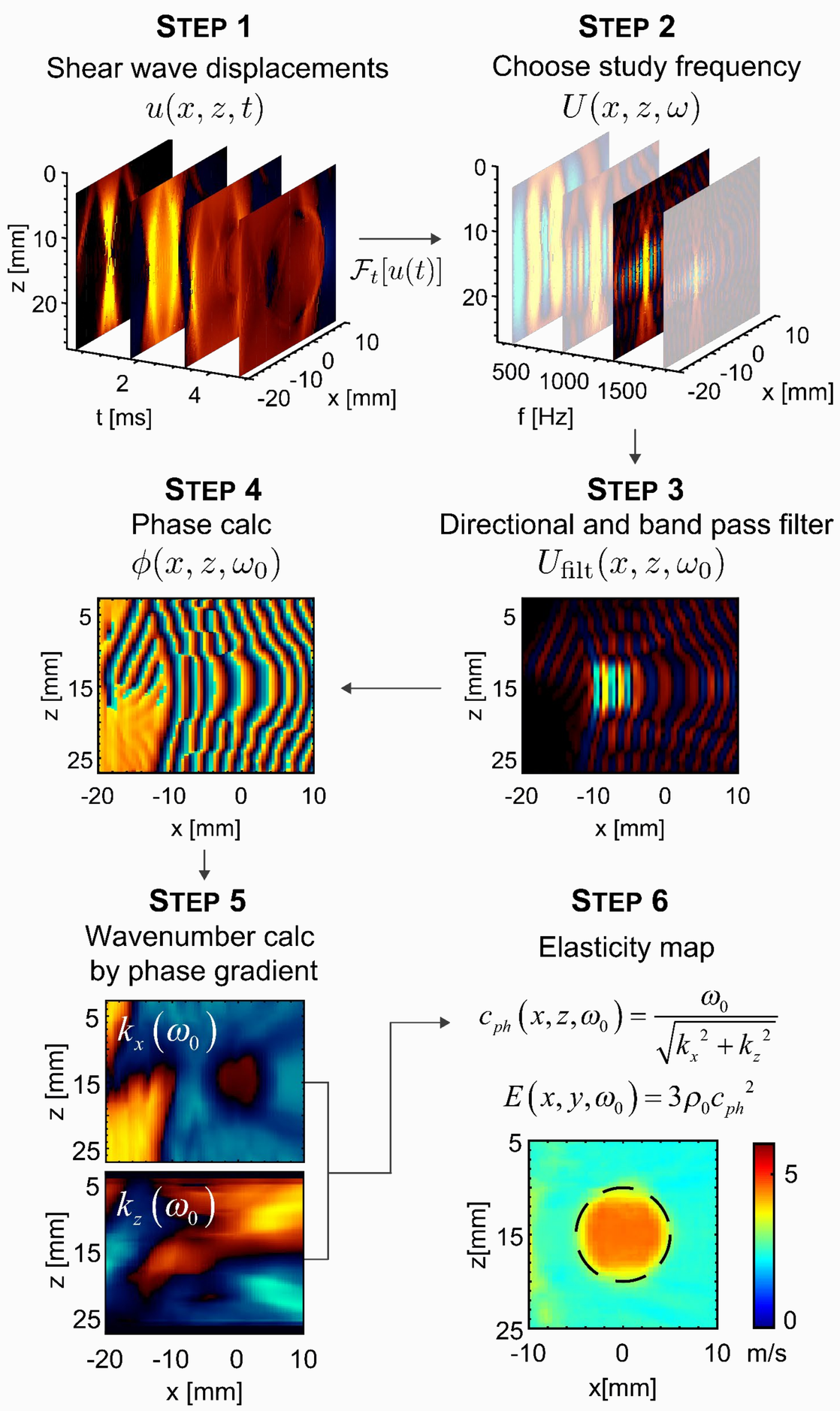
Shear-wave elastography is a technique used to calculate the elasticity and other mechanical properties of soft tissues. The **computational costs** associated with calculating the wavenumber of the propagating waves using spatiotemporal Fourier transforms are **remarkably high**.

Our proposal

This work outlines a straightforward algorithm to **find the wavenumber** by combining angular spectrum process and a local phase gradient estimator. Therefore, it presents a **low complexity** and can be implemented in real-time applications.

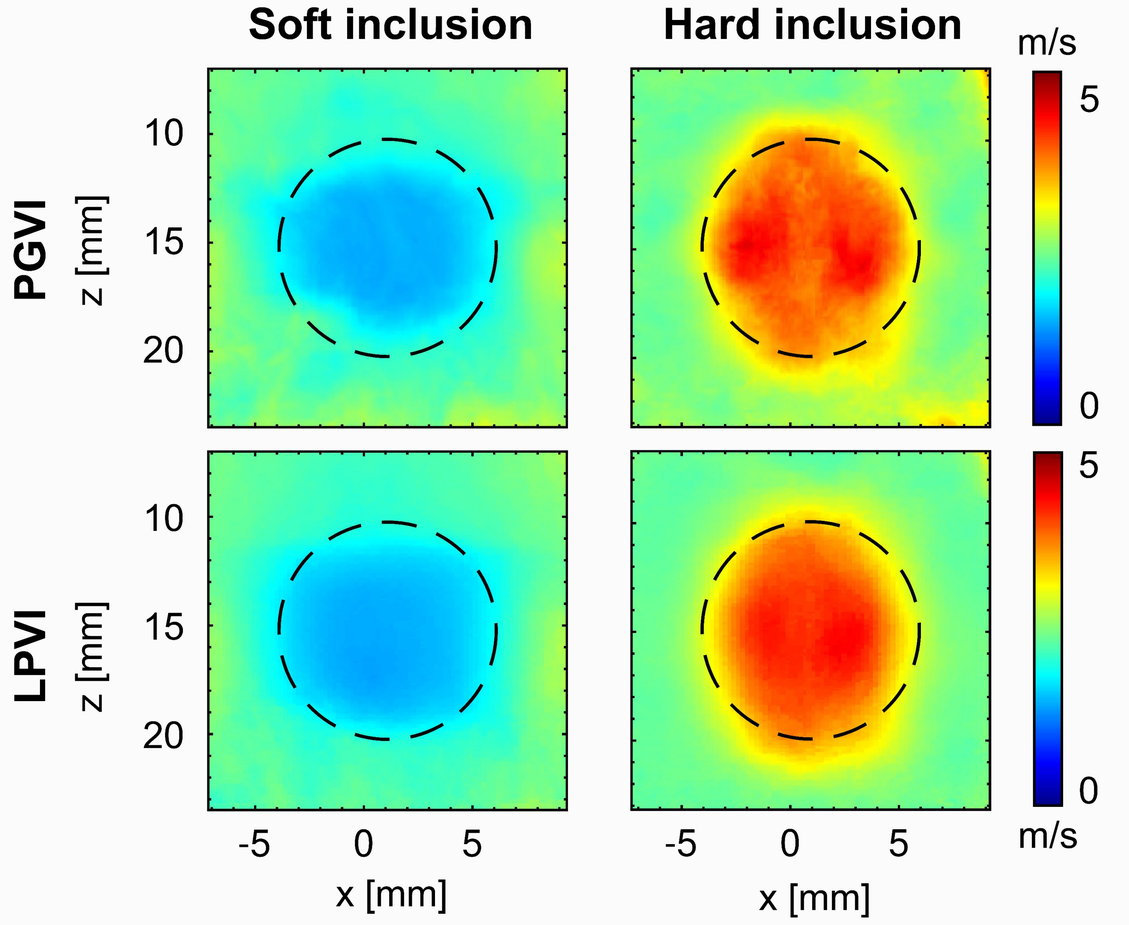
Methods

The elastography imaging algorithm is composed by 6 steps:

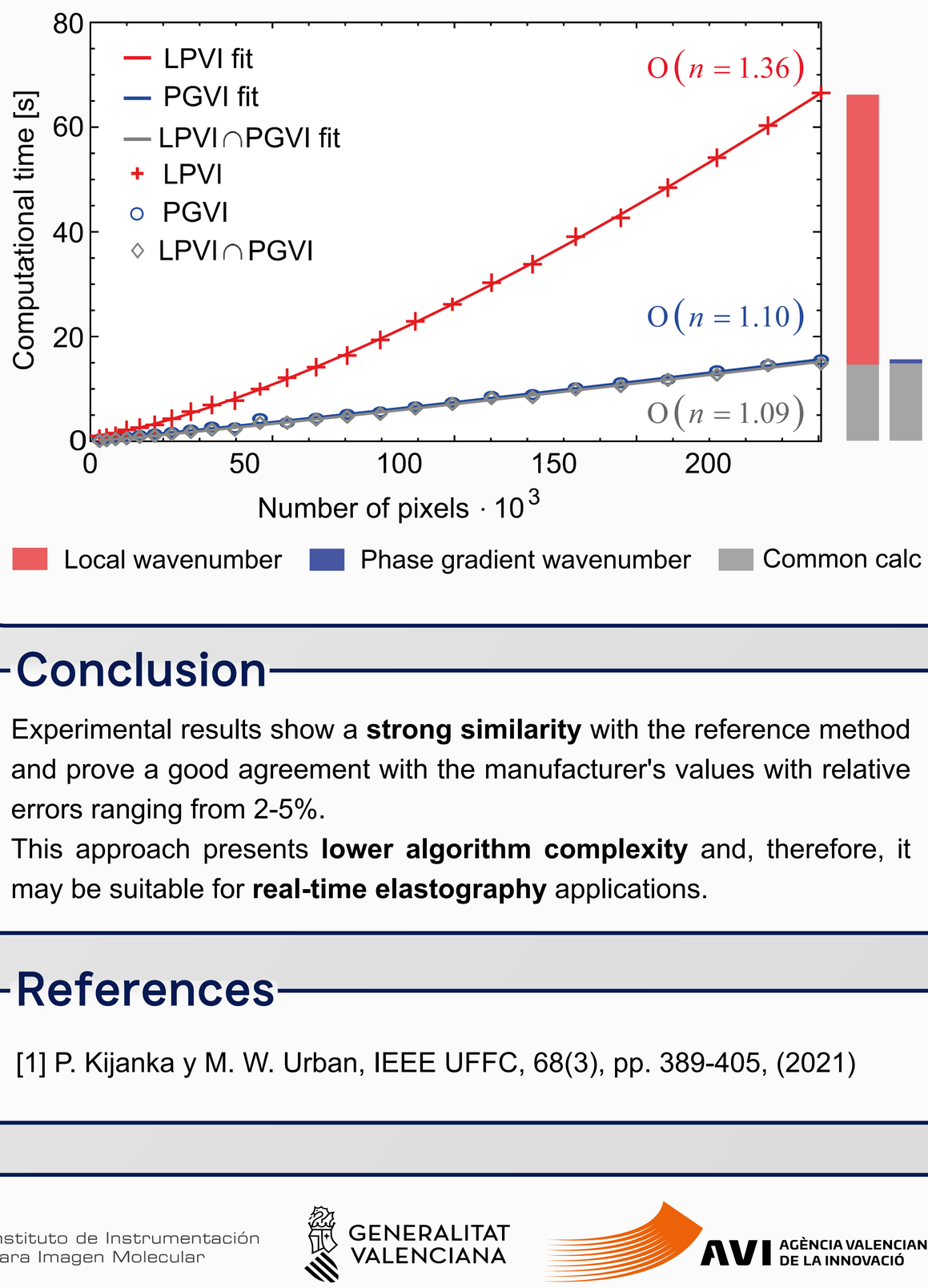


Results

A CIRS phantom of elasticity composed of different spherical inclusions of various elasticities was used to validate the method. The elasticity maps obtained by the phase gradient method are compared with a state-of-art techniques based in local wavenumber estimation [1].



Computational time of our proposed method is compared with local wavenumber method for different map sizes to study algorithm complexity.



Conclusion

Experimental results show a **strong similarity** with the reference method and prove a good agreement with the manufacturer's values with relative errors ranging from 2-5%.

This approach presents **lower algorithm complexity** and, therefore, it may be suitable for **real-time elastography** applications.

References

[1] P. Kijanka y M. W. Urban, IEEE UFFC, 68(3), pp. 389-405, (2021)

IEEE IUS 2023 International Ultrasonics Symposium
Palais des congrès de Montréal || September 3-8, 2023