VARIATIONAL STRATEGIES FOR INVERSE PROBLEMS IN BIOMECHANICS

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Abstract. In recent times, there has been an increased focus on developing data assimilation techniques for interpreting medical data. This surge is primarily driven by the growing demand for non-invasive methods in the prevention, diagnosis, and treatment of various diseases [1, 2].

Variational strategies are among the more popular avenues to offer a solution for this sort of problems. In this framework, a parameter, or a state, is computed by means of both fundamental ingredients: models and measures. The former is typically assumed as a governing partial differential equation, while the later is normally some sensor information, or an image.

This work offers a small review of the state of the art of inverse problems for state estimation in biomechanics, while it builds on top some useful strategies for scenarios where the dynamics of the underlying state has a complex Kolmogorov n-width, or where the sensor information is particularly degraded by observation bias.

We show the capabilities of this improvements in realistic scenarios for two image modalities: Doppler ultrasound [3] and Magnetic resonance elastography [4].

Keywords: Inverse problems, Model order reduction, Hemodynamics.

References

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