

REFeree's COMMENTS

Title	Model Adaptivity for Goal-Oriented Inference Using Adjoint
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Journal	CMAME
Ref no.	2016-1395

Summary:

This paper addresses the solution of inverse problems with the aim of reducing the error in the subsequent computation of quantities of interest (QoIs) using the calibrated model. The focus is on using mixed-fidelity models and spatially adapting the domain, using a higher-fidelity model in regions critical to accuracy in the QoI while using a lower-fidelity model in other regions of the domain. Adjoint-based error estimates are used to assess error in the QoI and drive adaptation. The theory is a logical extension of previous work. Barring additional details to make the manuscript more complete, it is reasonably well written and provides examples that adequately illustrate the methodology.

Recommendation: Accept with Minor Revision

Comments:

1. I'd like to actually see the statement and proof of Proposition 3 from reference 7 included in the manuscript. It is at the crux of the proof and it's frustrating to have to go dig up that detail.
2. I'd like to see the details of the error estimate localization included in the manuscript instead of delegating to a reference. The given description is quite "wordy" and not very precise.
3. The spirit of the examples is fine, but I'm not following some of the details. They state for the example in Section 4.1 that $f(q) = q$, but then the exact underlying field varies in space. To what space does $f(q)$ belong? Based on the example in Section 4.2.1, it looks like it's a constant. If the parameters are spatially dependent, what underlying basis is being used for its representation? Is the mesh refined enough to rule out pollution of the results due to discretization error?
4. It could be illustrative to see how the parameters q change with the refinement process.
5. Figure 3 is not particularly illustrative, especially on linear scale. Perhaps some tuning of the refinement parameters? What were the refinement parameters for the examples?