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A LIGHTWEIGHT APPROACH TO PARALLEL ADAPTIVITY IN ELECTROPHYSIOLOGY

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We propose and discuss a novel lightweight adaptive algorithm which aims at combining the plainness of structured meshes with the resolving capabilities of unstructered adaptive meshes. Our patch-wise adaptive approach is based on locally structured mesh hierarchies which are glued along their interfaces by a non-conforming mortar element discretization. To further increase the overall efficiency, we keep the spatial meshes constant over suitable time windows in which error indicators are accumulated. This approach facilitates strongly varying mesh sizes in neighboring patches as well as in consecutive time steps. For stability reasons, for the transfer of the dynamic variables between different spatial approximation spaces, a discrete L^2-projection is used. Finally, we derive a spatial preconditioner for elliptic problems, which is tailored to the special structure of the patch-wise adaptive meshes.

We analyze the (parallel) performance and scalability of the resulting method by several realistic examples from computational electrocardiology of different sizes and furthermore compare our method to a standard adaptive refinement strategy using unstructured meshes. As it turns out, our novel adaptive scheme provides a very good balance between reduction in degrees of freedom and overall parallel efficiency.

REFERENCES

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