An algorithm for the unrefinement of domain parameterizations in isogeometric analysis

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This talk is devoted to unrefinement of representations of computational domains (parameterizations) in isogeometric analysis [1]. Unrefinement allows to perform faster simulations while maintaining a reasonable level of the precision in the specified area. We present an algorithm that creates a coarser parameterization $\tilde{\mathbf{p}}(u, v)$ (i.e. with the less degrees of freedom) from a given parameterization $\mathbf{p}(u, v)$. Both parameterizations are assumed to be represented via THB-splines [2]. Moreover, the coarser parameterization possesses the following properties:

- The dimension of the space spanned by the THB-splines basis functions, which are used to represent a $\tilde{\mathbf{p}}(u, v)$, is lower.
- The coarser parameterization $\tilde{\mathbf{p}}(u, v)$ is regular. In particular, no self-intersections are allowed to be present.
- The created parameterization $\tilde{\mathbf{p}}(u, v)$ approximates the initial parameterization $\mathbf{p}(u, v)$ globally with a given precision.
- On a part of a domain boundary ("feature") the coarser parameterization $\tilde{\mathbf{p}}(u, v)$ approximates $\mathbf{p}(u, v)$ globally with a given lower precision.

The algorithm uses local projectors [3] and different local optimization techniques [4] to ensure the approximation and regularity properties.

Joint work with: Annalisa Buffa, Bert Jüttler.

References

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