Shape Optimization of a Compact DC Photo-Electron Gun using Isogeometric Analysis

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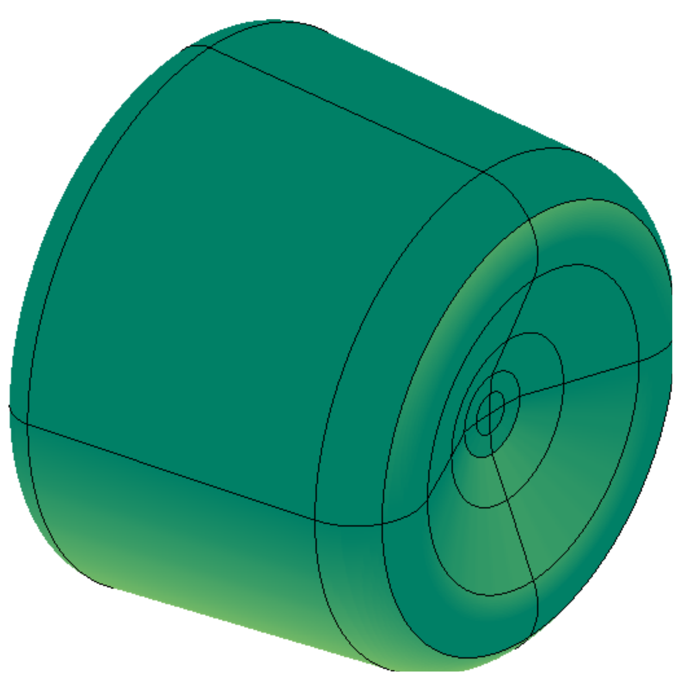
Motivation

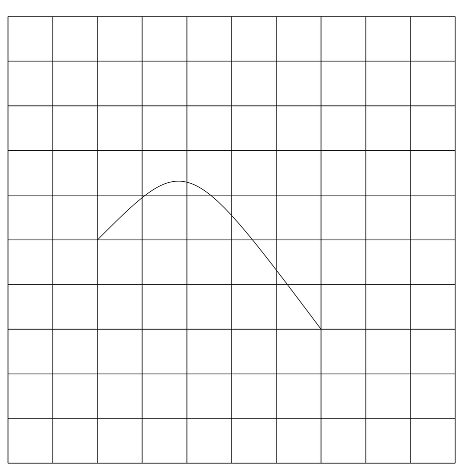
Compact DC photo-electron guns are able to meet the sophisticated demands required for high-current applications such as energy recovery linacs. A main design parameter for such sources is the electric field gradient, which is limited by the field emission threshold of the electrode material. Optimizing the electrode geometry allows for higher gradients and thus increases gun perfomance. The underlying electrostatic problem is described by Maxwell's equations and the PDE reads

$$\nabla \cdot (\varepsilon \nabla \varphi) = 0 \text{ in } \Omega \quad \text{and} \quad \varphi = \varphi_0 \text{ on } \partial\Omega,$$

where φ is the electrostatic potential, ε the electric permittivity and Ω the problem domain.

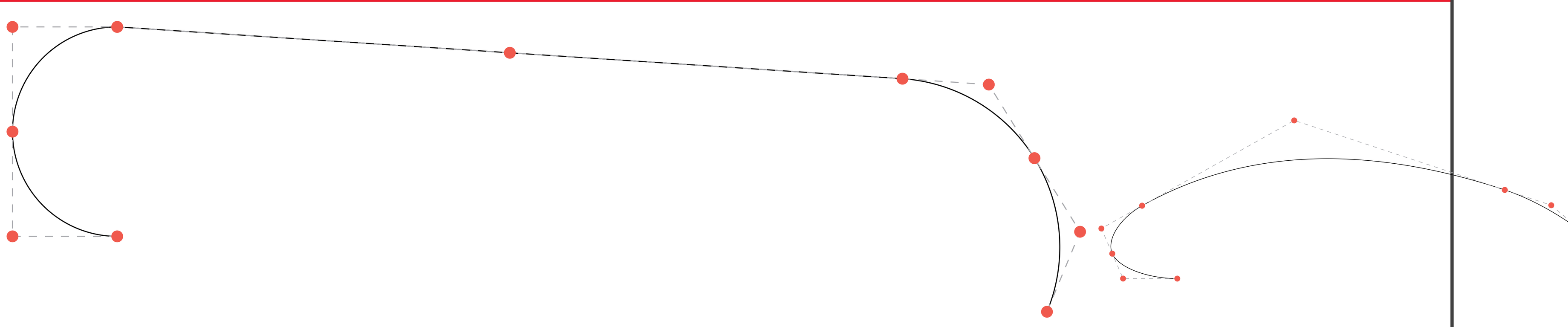


Isogeometric Analysis



introduce nurbs, show 2d geometry with control mesh, mention iga as FEA method with nurbs basis functions

Geometry Optimization



state optimization problem, show C1 nurbs that is optimized

Results

show field magnitude for starting and optimized geometry (also values?)

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