**Boundary concentrated finite elements for optimal control problems with distributed observation**

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We consider the discretization of an optimal boundary control problem with distributed observation by the boundary concentrated finite element method. With an $H^{1+\delta}(\Omega)$ regular elliptic PDE on two-dimensional domains as constraint, we prove that the discretization error $\|u^* - u_h^*\|_{L_2(\Gamma)}$ decreases like $N^{-\delta}$, where $N$ denotes the total number of unknowns. For the case $\delta=1$ in convex polygonal domains, the discretization error for $h$-FEM behaves like $N^{-3/4}$, whereas for boundary concentrated FEM the discretization error behaves like $N^{-1}$. This makes the boundary concentrated FEM favorable in comparison to $h$-FEM. This method is also suitable for treating piecewise defined data and a tracking functional acting only on a subdomain of $\Omega$. We present several numerical results.