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Optimal control inspired algorithm for real-space optimization with application to Majorana fermion experiments SAMUEL BOUTIN, JULIEN CAMIRAND LEMYRE, SARA TURCOTTE, Institut quantique, Université de Sherbrooke, MICHEL PIORO-LADRIRE, Institut quantique, Université de Sherbrooke and Canadian Institute for Advanced Research, ION GARATE, Institut quantique, Université de Sherbrooke — Inspired by the success of optimal control theory algorithms in the design of new, fast and accurate gates for quantum information processing, we import the mindset of these time-domain optimization strategies to static real-space functions in solid-state systems. Combining ideas from the GRAPE (Gradient Ascent Pulse Engineering) algorithm and transport calculations, we devise a new gradient-based algorithm for the optimization of transport-related quantities through the real-space variation of experimentally controllable parameters. This technique can be useful for the design of experiments in mesoscopic solid-state systems. As an example, we apply our algorithm to the optimization of the topological visibility of Majorana fermions in superconducting nanowires without spin-orbit coupling in a non-uniform magnetic field.

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