Objective-First Nanophotonic Design Plan

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1 Goal

Software to solve the following general inverse design problem, specfically for nanophotonics.

$$\text{minimize} \quad f(x) + g(z) \tag{1a}$$

$$\text{subject to} \quad A(z)x - b(z) = 0 \tag{1b}$$

where $f(x)$ and $g(z)$ are the *design objectives* for the field (x) and structure (z) variables respectively, and $A(z)x - b(z)$ is the *physics residual* of the problem.

2 Strategy

The general strategy is to divide the problem into field and structure subproblems, which can be tackled separately and in a modular fashion by using various *optimization paradigms* and *structure parameterizations* interchangeably.

Specifically, the available optimization paradigms are

- adjoint
- ob-1

and the available structure parameterizations include

- point
- boundary
- shape
- include/exclude