This paper presents a new global optimization algorithm specifically tailored for inverse reflector design. In these problems, the goal is to obtain a reflector shape that produces a light distribution as close as possible to a user-provided one. The optimization is an iterative process where each step evaluates the difference between a reflector illumination and the desired one. We propose a tree-based stochastic method that drives the optimization process, using some heuristic rules, to reach a minimum below a threshold that satisfies the user-provided requirements. We show that our method reaches a solution in less steps than most other classic optimization methods, also avoiding many local minima.