

Topology optimisation for periodic structure in wave scattering problem

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Periodic structures such as photonic crystal are expected to play a major role to realise innovative wave devices. So far, several optimum design methods are proposed to develop, for example, a photonic crystal with a wide bandgap, metamaterial which exhibits negative refraction and so on. Although the finite element method (FEM) is a widely accepted numerical method in designing various engineering devices, the boundary element method (BEM) may be superior to FEM for designing wave devices. This is partly because the BEM can take into account the radiation condition in an exact manner. In fact, we have developed topology optimisations in acoustic, elastic and electromagnetic waves, and confirmed its efficiency. In this talk, we would like to extend our BEM-based methodology to periodic structures and show examples of optimum designs of an acoustic diode and photonic crystal.