

Nuisance noise silenced by an acoustic cloak

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Researchers in Spain have proven that metamaterials, materials defined by their unusual man-made cellular structure, can be designed to produce an acoustic cloak - a cloak that can make objects impervious to sound waves, literally diverting sound waves around an object.

The research, 'Acoustic cloaking in two dimensions: a feasible approach', published today, Friday, 13 June, 2008, in the *New Journal of Physics (NJP)*, builds on recent theoretical research which has sought ways to produce materials that can hide objects from sound, sight and x-rays.

Daniel Torrent and José Sánchez-Dehesa from the Wave Phenomena Group, Department of Electronics Engineering at the Polytechnic University of Valencia, cite theoretical work published early last year in NJP by researchers from Duke University in North Carolina, US, as the starting point for their more practical approach.

To realise the cloak physically, the Spanish research team calculated how metamaterials constructed with sonic crystals, solid cylinders in a periodic array that can scatter sound waves, could be used in a multilayered structure to divert sound completely around an object.

The researchers performed multiple simulations to test their theory. They investigated the optimum number of layers required to completely divert sound and how thin the materials could be made to maintain their use but also ensure that they are easy to implement.

Results were very encouraging, showing that optimum cloaking requires approximately 200 layers of the metamaterial but that there is scope for much thinner materials to be used than technology can currently produce. So, put simply, watch this space.

José Sánchez-Dehesa, one of the lead researchers, writes, "We hope that this proposal will motivate future experimental work demonstrating the materials' performance."

One of the first uses of the material is likely to be warships, hoping to avoid sonar radars which pick up on the noise that ships emit, but if developments continue apace it could be used in concert halls to direct noise away from problem spots or even as a way to deal with noisy neighbours.

Citation: The published version of the paper "Acoustic cloaking in two dimensions: a feasible approach" (Torrent D and Sanchez-Dehesa J 2008 New J. Phys. 10 063015) will be available online from Friday, 13 June at stacks.iop.org/NJP/10/063015 .

Source: Institute of Physics

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