Acoustic cloaking device echoes advances in optical cloaking

August 15 2011

Optical cloaking devices that enable light to gracefully slip around a solid object were once strictly in the realm of science fiction. Today they have emerged as an exciting area of study, at least on microscopic scales.

A new twist on this intriguing technology can now be "seen" in the field of acoustics. A team of researchers from the Universitat Politecnica de Valencia and the Universidad de Valencia have created a prototype of an acoustic cloak by using a 2-D mathematical model.

Unlike sound-canceling technologies that eliminate noise by creating the exact-but-opposite waveform, an acoustic cloak would enable sound waves to travel around an object without changing their shape or direction.

The proposed sound cloak, as described in the AIP's journal *Applied Physics Letters*, would consist of 120 cylinders, each 15 millimeters in diameter.

By carefully arranging them around an object 22.5 centimeters across, the researchers experimentally demonstrated that sound waves of a specific frequency (3061 Hertz, with about a 100-Hertz bandwidth) maintain their original wave-front pattern as they pass around and beyond the object.

According to the researchers, the narrow operating band of the cloak can be overcome by increasing the number of cylinders used to create the

cloak.

If such a technique could be applied in real-world designs, it could enable better soundscapes in urban environments, better acoustics in performance halls, and quieter helmets that protect the ears from extreme noises, the researchers speculate.

"Acoustic cloak for airborne sound by inverse design" is published in Applied Physics Letters.

Provided by American Institute of Physics