

New invisibility cloak allows object to 'see' out through the cloak

March 13 2009, By Miranda Marquit

(PhysOrg.com) -- "Many groups have been working devices that make objects invisible," Che Ting Chan tells *PhysOrg.com*. "Most of these devices, however, encompass the object to be cloaked." Chan, a scientist at The Hong Kong University of Science and Technology, believes that it is possible to create a cloaking device that would be able to render an object invisible without encompassing it.

"With the devices that encompass the object," Chan continues, "the cloaked subject is 'blind'. It can't 'see' out through the cloak. We can't see the object, but the object can't see us, either. We wanted to create a conceptual design that would let the object 'see' out through the cloak while hiding it from sight." Along with Yun Lai, Huanyang Chen and Zhao-Qing Zhang, Chan believes that this could be accomplished. Their ideas are published in [Physical Review Letters](#): "[Complementary Media Invisibility Cloak](#) that Cloaks Objects at a Distance Outside the Cloaking Shell."

Right now, such a device exists only theory. "We haven't built the device," Chan says, "but we have shown mathematically how it could work. It is a very specific description of the materials needed. If you have the time and resources, we think it could be done." He points out that it might have interesting possibilities in a number of fields where invisibility might be desirable.

Theoretically, a device such as Chan suggests, would work through complementary media. "Our strategy is to put the [cloaking device](#) and

the object to be cloak next to each other. The cloaking device is a kind of anti-object. The way the light is gathered and scattered by the two objects - the cloaking device and the object it is making invisible - would cancel each other out.” Chan continues by explaining that the cloaking device would become invisible as well. “Both must be invisible in order for this to be effective, and I think we have shown in theory how this could work.”

Chan admits that 100 percent invisibility is only available for one wavelength, however. “Right now, the usefulness, especially for military applications, is limited,” he says. “You can only make the object invisible in one wavelength, so if I made it invisible for the visible spectrum, all someone would have to do is use radar to detect the object. A lot of work would need to be done to make a cloaking device that worked for more wavelengths.” He pauses, before adding, “It might be possible to make the object almost invisible for broader wavelengths, but that would also take a lot of work. And you still wouldn’t have 100 percent visibility.”

The Hong Kong team, although interested in rendering objects invisible, is working on another ambitious project. “We have shown that we can cause invisibility in objects, and allow them to ‘see’ out of the cloak,” he says. “We are now working on how to transform how an object looks. Invisibility was just the first step in this. By understanding how complementary media invisibility might work, we can also look at how it might be possible to transform the look of an object into something else. Perhaps make an apple look like a banana.”

Science is beginning to sound more like magic by the day.

More information: Yun Lai, Huanyang Chen, Zhao-Qing Zhang, and C. T. Chan, “Complementary Media Invisibility Cloak that Cloaks Objects at a Distance Outside the Cloaking Shell.” *Physical Review Letters*

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