

Light speed hurdle to invisibility cloak overcome by undergraduate

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(PhysOrg.com) -- An undergraduate student has overcome a major hurdle in the development of invisibility cloaks by adding an optical device into their design that not only remains invisible itself, but also has the ability to slow down light.

The [optical device](#), known as an 'invisible sphere', would slow down all of the light that approaches a potential cloak, meaning that the light rays would not need to be accelerated around the cloaked objects at great speeds — a requirement that has limited invisibility cloaks to work only in a specified region of the visible spectrum.

This new research, published today, Tuesday 9 August, in the Institute of Physics and German Physical Society's *New Journal of Physics*, could open up the possibility for a potential invisibility cloak wearer to move around amongst ever-changing backgrounds of a variety of colours.

Under the guidance of Professor Ulf Leonhardt, Janos Perczel, originating from Hungary and reading Logic, Philosophy of Science and Physics at the University of St Andrews, acknowledged the huge potential of the invisible sphere and was able to fine-tune it so that it was a suitable background for cloaking.

The usual approach to designing an [invisibility cloak](#) works on the basis of bending light — using highly specific materials — around an object that you wish to conceal, thereby preventing the light from hitting the object and revealing its presence to the eye of the observer.

When the light is bent, it engulfs the object, much like water covering a rock sitting in a river bed, and carries on its path making it seem as if nothing is there.

Light, however, can only be accelerated to a speed faster than it would travel in space under certain conditions, and this restricts invisibility cloaks to work in a limited part of the spectrum — essentially just one colour.

This would be ideal if somebody was planning to stand still in camouflage; however, the moment that they start to move the scenery will begin to distort, revealing the person under the cloak.

By slowing all of the light down with an invisible sphere, it does not need to be accelerated to such high speeds and can therefore work in all parts of the spectrum.

Perczel said, "I started to work on the problem of superluminal propagation as Professor Leonhardt's summer student with an EPSRC grant. Once the idea was present, I worked for over eight months to overcome the technical barriers and to make the proposal practicable."

An Institute of Physics spokesperson said, "This new development opens up further possibilities for the design of a practical invisibility [cloak](#) — overcoming the problem of [light](#) speed that other advances have struggled to address and, very impressively, this significant advance was achieved by an undergraduate student."

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