Researcher slashes optics laboratory costs using customizable 3-D printable designs

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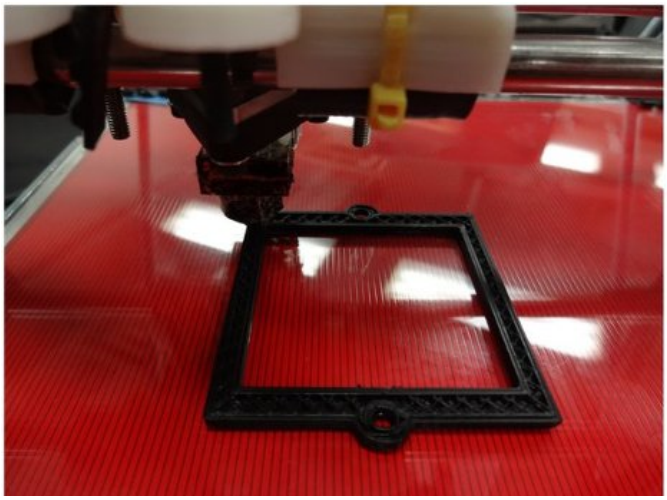
Helical Crayford Focuser. Credit: Thingverse



An open-source 3D printer printing an optical component, specifically, a filter bracket.

(Phys.org) —Just as the power of the open-source design has driven down the cost of software to the point that it is accessible to most people, open-source hardware makes it possible to drive down the cost of doing experimental science and expand access to everyone. As part of this movement, a Michigan Technological University lab has introduced a library of open-source, 3-D-printable optics components in a paper published in *PLOS One*.

Joshua Pearce, an associate professor of materials science and engineering and electrical and computer engineering at Michigan Tech, explains: "This library operates as a flexible, low-cost public-domain tool set for developing both research and teaching optics hardware."

The designs were made customizable using OpenSCAD, an open-source, computer-aided design software tool, and printed on open-source RepRap 3-D printers. The electronics and controls are based on the open-source Arduino microcontroller environment.

The study found cost reductions generally over 97 percent, with some components representing only 1 percent of the current commercial investment for optical products of similar function. "For example, commercial optical rail sells for around $380 per meter, and you can build an open alternative with printed parts for less than what you would pay in sales tax," says Pearce. "And there is no sales tax, shipping costs or waiting for parts to come in stock or ship".

This study shows that this method of scientific hardware development enables a much broader audience to participate in optical experimentation, both for research and teaching, than previous proprietary methods. For example, to outfit an undergraduate teaching laboratory with 30 optics setups costs less than $500 using the open-source optics approach, compared to $15,000 for commercial versions.

"Saving money is nice, particularly for cash-strapped schools, but the real advantage of this approach is that it enables researchers to fabricate custom optics equipment in house. You get exactly what you need for your experiments, even if they are not commercially available," says Pearce, "This is the future of scientific equipment. We have only just started."

More information: C. Zhang, N. C. Anzalone, R. P. Faria and J.M. Pearce, "Open-Source 3D-Printable Optics Equipment" *PLOS One* (2013) dx.plos.org/10.1371/journal.pone.0059840

To download open optics designs from the paper and others see : www.thingiverse.com/jpearce/co … s/open-source-optics

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