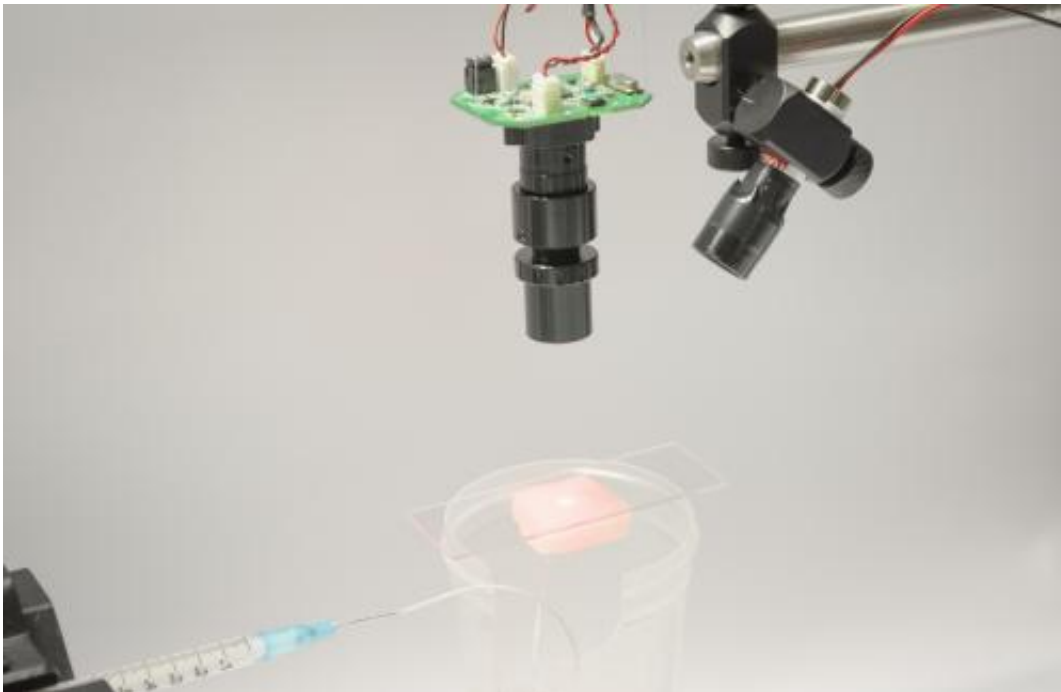


# Scientists rig hospital-grade lightweight blood flow imager on the cheap

September 26 2013

---



A laser pointer (top right) illuminates a microfluidic flow phantom (bottom center) and the speckle pattern is imaged onto a webcam (top center) to enable calculation of flow images. Credit: Andrew Dunn, University of Texas - Austin

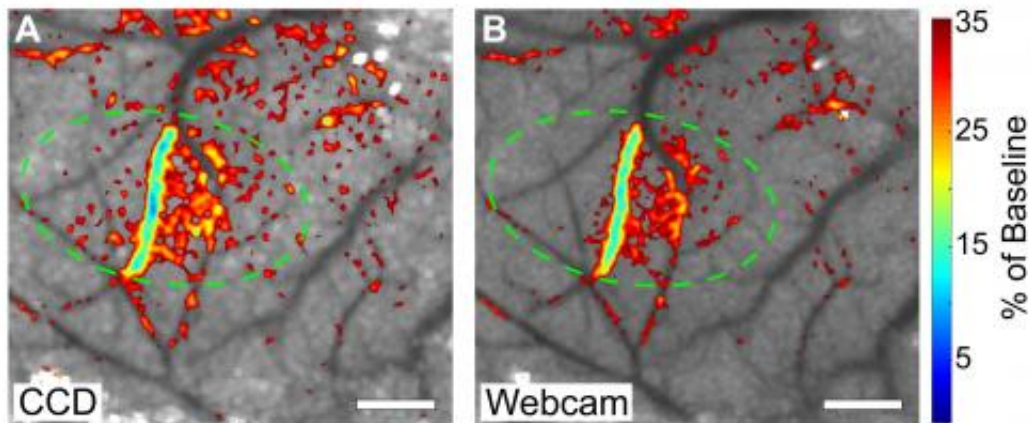
Tracking blood flow in the laboratory is an important tool for studying ailments like migraines or strokes and designing new ways to address them. Blood flow is also routinely measured in the clinic, and laser speckle contrast imaging (LSCI) is one way of measuring these changes; however, this technique requires professional-grade imaging equipment,

which limits its use. Now, using \$90 worth of off-the-shelf commercial parts including a webcam and a laser pointer, researchers at the University of Texas at Austin (UT-Austin) have duplicated the performance of expensive, scientific-grade LSCI instruments at a fraction of the cost. The work is the first to show that it is possible to make a reliable blood flow imaging system solely with inexpensive parts, the authors say. The researchers describe their development in the latest issue of the Optical Society's (OSA) journal *Biomedical Optics Express*.

"We demonstrate that the high cost of standard systems is unnecessary, because a system that costs \$90 can give equivalent results for both in vitro and in vivo imaging applications," said biomedical engineer Andrew Dunn, an associate professor and Dornberger Centennial Fellow in Engineering at UT-Austin and an author of the study.

Measuring [blood flow](#) changes using LSCI requires just a few parts – [laser light](#) to illuminate the tissue, a camera to record the image, and focusing optics to direct the [scattered light](#) to the camera – but at least one of them usually comes with a lofty price tag. The laser light reflects or scatters off the tissue and interferes with itself to create the speckle pattern collected by the camera. This speckle pattern provides a way to visualize the flow of blood within the tissue: areas with a high flow rate show up in the resulting image as blurrier speckles, which can be measured by their lower contrast. Together, all the parts can add up to as much as \$5,000.

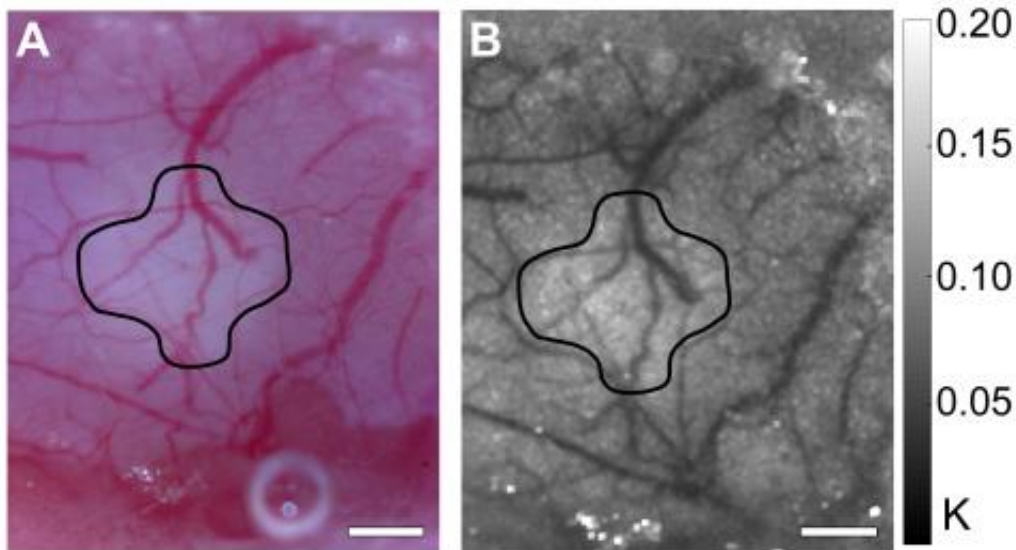
Unlike past attempts to create a cheaper speckle imager, the UT-Austin team's new method uses only inexpensive pieces of equipment. A \$5 [laser pointer](#) is used to illuminate the patch of tissue to be imaged. Light is reflected off the tissue and focused by a pair of generic 40-mm camera lenses onto the sensor of a \$35 webcam. The team used their setup to image changes in blood flow in a mouse model and found that they were able to identify areas of high flow versus low flow.



The webcam setup (right) is just about as effective as the more expensive CCD camera setup (left) at showing the reduction in blood flow following a stroke. The green circle shows the stroke's affected area. Credit: Andrew Dunn, University of Texas - Austin

At just 5.6 centimeters in length and weighing only 25 grams, the system is compact and lightweight, which would make it easier to transport for imaging applications outside of the lab, including clinics in areas with limited access to medical care, Dunn said.

Currently, the new system's field of view, which is just a few square millimeters across, and resolution are limited by the size of the webcam sensor, but future versions could have a more flexible layout.



A speckle contrast image (right) of the stroke-affected section of mouse brain averaged over 10 frames, with an image depicting the vascular anatomy (left) for comparison. Credit: Andrew Dunn, University of Texas - Austin

"The lens configuration could be easily adjusted to visualize even smaller structures by magnifying or to visualize larger structures by increasing the field of view, depending on what kind of flow the user is interested in visualizing," Dunn said.

**More information:** "Low-cost laser speckle contrast imaging of blood flow using a webcam," L. Richards et al., *Biomedical Optics Express*, Vol. 4, Issue 10, pp. 2269-2283 (2013). [www.opticsinfobase.org/boe/abs ... fm?uri=boe-4-10-2269](http://www.opticsinfobase.org/boe/abs/...fm?uri=boe-4-10-2269)

Provided by Optical Society of America

Citation: Scientists rig hospital-grade lightweight blood flow imager on the cheap (2013,

September 26) retrieved 23 June 2024 from <https://phys.org/news/2013-09-scientists-rig-hospital-grade-lightweight-blood.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.