2000x Microscope

Posted by wickededge - 30 Jun 2012 08:28

The new scope came in Wednesday and I'd hoped to kick off this category with some great hi-res pics, but then was out sick on Thursday and wrapped up in meetings on Friday so I didn't get a really good chance to play with it. I also still need to get a NIST traceable micro-ruler to calibrate it. If anyone knows of one for under $1200, I'd love to hear about it. Even without calibration though, I should be able to start posting some of the pics. At first glance, it looks pretty exciting. I can see the tiniest of scratches from our micro-abrasives really clearly, so with some luck and work, we should be able to learn a whole lot about all the stones and strops.

==========

Re: 2000x Microscope

Posted by AnthonyYan - 04 Oct 2012 07:44

Hi Clay,

After seeing your recent images, I've been wondering about the same thing. Probably we can apply some methods from Computer Vision to measure scratch widths. For example, there are open-source software libraries like OpenCV for doing computer vision.

I can't promise much, because I haven't much free time, and it's often not clear if the algorithms will give a clear and definitive measurement. The advantage is that an algorithm will give an unbiased answer. More precisely, if the algorithm is biased (such as a tendency to underestimate measurements), at least that bias will tend to be consistent and reproducible.

I'm reminded of the tennis player Andre Agassi. He complained that even the latest high-tech ball-tracking computers would make incorrect line calls. But he was consoled by the fact that the calls were made by a machine that has no bias as to who should win the match.

Sincerely,

--Lagrangian

P.S. For those with a technical background:

To analyze the images for scratch width, I have some general ideas right now:

(1) There are many papers about computer image-analysis in the medical industry. For example, given a tissue sample, these algorithms estimate things like the distribution of diameters of blood-vessles, etc.

(2) For scratch patterns which are parallel, maybe we could simply apply Fourier Analysis and look at the distribution of harmonic components in the frequency domain. It probably won't happen, but if we are _super lucky_ there would be a dominant peak at the average scratch size.

(3) There are various edge-detection methods in computer vision, such as the Canny edge detector, and things in computer vision called "snakes". A snake is basically a line or curve that is iteratively adjusted to find an edge or feature in an image. So it "wiggles" into position.

(4) There are a bazillion variants of these ideas, but we should probably just try the simplest ones (unless some of them are already implimented in free public packages, such as OpenCV).

(5) It can be tricky to estimate the accuracy and precision (ie: uncertainty) of the results, especially when we do not have test cases where we know ground-truth.

(6) Computer vision is much more difficult than would naively appear; many algorithms are extremely sensitive to signal-to-noise ratios, small changes in lighting direction, focus, and so on. Consider that in the 1960's, people thought computer facial recognition would be solved in a couple of years. It is only 40+ years later, that computer facial recognition is mature enough to be put in consumer cameras, and used in some security systems. And even then, facial recognition is often not reliable.

(7) Computer-vision might be the wrong tool for this problem. Instead, perhaps, measurements from a contact profilometer might be the most direct answer. If the contact-profilometer can show us the trace of a single scan-line, that would tell us a lot! Engineers in Surface Metrology must have good ways of doing such measurements.

==========