The Need for Speed in Whole Slide Imaging:

Why Total Scanner Throughput Beats Scan Speed Every Time

Embrace the Future of Digital Pathology

HURON Digital Pathology

Introduction

For the time being, the Hennessey Venom GT is the fastest production car in the world with a top speed of 270 MPH. It is an impressive, and jaw-dropping, engineering feat. Apart from the simple practicality of owning such a vehicle (it sells for $1.2 million and has a long waiting list), where can you ever drive such a vehicle at that top speed? You will no doubt require a professional driver and a long straight-away. Sure, you will receive admiring glances from on-lookers as you drive it through town at 35 MPH, but it's a bit of a waste of the 1451 hp and 1287 lb.-ft. of torque.

Like automobile manufacturers, whole slide scanner vendors are quick to quote top scan speeds as if these speeds somehow represent throughput under normal operation. In reality, a typical slide scanner with a top scan speed of say, 60 slides per hour, is more likely somewhere around 20-25 slides per hour once you take into account the other factors affecting throughput.

Let's take a moment to look at the three main inhibitors to total scanner throughput and then we'll see what can be done to improve total throughput.

The need for re-scanning or special treatment during scanning

Using the average scanner, the following slide conditions will require special attention:

- Faint tissue often presents a scanning challenge. During setup, the scanner's preview camera may not accurately detect tissue and therefore may not set up the correct area of interest, resulting in missed tissue. Thus, the slide must be re-scanned.

- Multiple barcodes, one on top of each other, can make the slide too thick for scanners with robotic handlers to manage, causing rejection and the need for rescanning.

- Barcodes in two different positions is a challenge for scanners with fixed-position bar code readers.

- Globs of mounting medium on the slide regularly cause problems for scanners with robotic slide handlers.

- Labels that are not sticky or are overhanging the slides don't work well with robotic style slide scanners, requiring manual scanning.

- Slides with chipped glass must be recut or scanned manually.

Huron Digital Pathology
550 Parkside Dr. Unit B6
Waterloo, ON Canada N2L 5V4
T 519.886.9013 F 519.886.5300
Email: info@hurondigitalpathology.com
www.hurondigitalpathology.com

Extra time required in slide preparation

Most slide scanners are designed to accommodate pristinely prepared slides with little variability. In the real-world this is not the case. Moving to digital workflows often require lab staff to take extra time to reduce the variability in preparation so scanner throughput can be optimized. While not normally counted as a factor in total scanner throughput, this extra preparation time has a direct impact on the efficiency of the workflow.

Scanner downtime during preview and setup

Scan preview and set-up is a critical step for ensuring all slides are properly imaged. However, this step can be time-consuming, costing 10-20% of scanner throughput each day. Instead of acquiring images, the expensive investment (the medium to high throughput slide scanner) effectively sits idle during setup. Further, the power of these scanners is routinely wasted when spent taking low-resolution preview images, reducing overall throughput.

So, how do we improve total scanner throughput?

The first step is to see beyond raw scan speed and recognize that total scanner throughput is a function of scan speed plus the other factors described above.

Then look for a whole slide scanner with the following features:

- A tray-based slide holder that can handle
  - different slide thicknesses due to multiple bar codes;
  - labels that may not be sticky or are overhanging the slide;
  - slides with globs of mounting medium; and
  - slides with chipped glass

- The ability to scan both clear and faint tissue to achieve scanning success

- A full slide, image-based bar code reader that can read bar codes wherever they may be on the slide

- The ability to off-load slide previewing and setup to ensure that the scanner is scanning at maximum resolution and speed with the highest uptime

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About Huron Digital Pathology

We believe that innovation is the key to making digital pathology a ubiquitous reality. But for us, innovation is about more than just delivering great image quality and fast scanning speeds. It's also about designing products that are simple to use, easy to integrate with your workflow, and have attractive price-performance characteristics.

Based in Waterloo, Ontario, Canada, Huron Digital Pathology has a 20 year history designing sophisticated imaging instrumentation. Our end-to-end digital whole slide scanning solutions for digital pathology incorporate our award-winning TissueScope™ digital slide scanners and our TissueSnap™ preview scanning station. Visit us at www.hurondigitalpathology.com

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