Developing a digital histopathology platform to support an international diabetes biobank

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Introduction

Biobanks are a novel application field for digital pathology. The Brussels Free University (VUB) and its teaching hospital UZ Brussel, together with the Belgian Diabetes Registry have developed one of the world's largest biobanks in the domain of type 1 diabetes. It contains >100.000 blood/DNA samples from patients with type 1 diabetes and their family members in addition to > 4.000 tissue samples from both diabetic and normal pancreas. A digital histopathology platform was deployed to facilitate access to the tissue collection and promote basic and clinical research.

How to set up digital histopathology?

- Phase 1A: Educational use
- Phase 1B: Hardware platform
- Phase 2A: Historical collections
- Platform 2B: Integration with HIS / LIS
- Phase 3: Live clinical biobank

Opportunities for educational use

Because no use case for digital pathology stands on its own, an separate website was built to promote the concept of digital histopathology throughout the faculty (and university). These websites are publicly available at http://histology.vub.ac.be and http://pathology.vub.ac.be.

We do not believe that digital media are a replacement for hands-on histology teaching (under the microscope), but they can add siginicant value to a course. Because it is not a substitute, interaction between "old" and "new" was further facilitated by providing the typical tissue snapshots in the course textbooks with QR-codes. When scanned with a smartphone or tablet, the underlying URLs automatically direct to the slide being discussed and invite for further study.

A new challenge emerges: mobile pathology

An important question to ask when developing a platform for wide use is: "who are you users going to be?". A high-use test was therefore undertaken of the software platform in an educational setting at an ESP-course in Craiova, Romania, in September 2014, with around 80 participants. Course attendants were asked to bring their own wireless device and connect to our website with their preferred browser. We found that many students were interested in mobile pathology, judging from the large number of Android user agents that were detected later on. The most prevalent browsers were Google Chrome (57%) and Mozilla FireFox (23%). Android and iPhone were good for 13%.

The new question that comes out of this is: how does one translate the rich content of a histological slide to a small mobile display device? While the resolution of these displays is now sharp enough to render content with the same ease as on the desktop, it is unclear what added value this can offer to the pathologist (a desktop screen is still more useful for diagnostic activities). Still, if users prefer this method of intereaction, the field of digital pathology is dure to progress more quickly by facilitating it.

Material & methods

The most interesting cases from the biobank were selected and digitized. Clinical data is available side by side to whole slide image data in a seamless and transparent interface, assisting the researcher to make an optimal selection of material of interest for a particular study. Digital pathology is thus presented as a natural add-on to a biobank query interface.

Figure 1

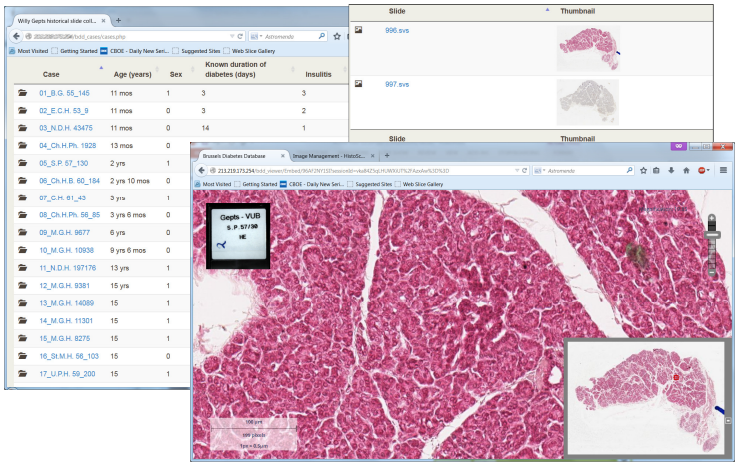
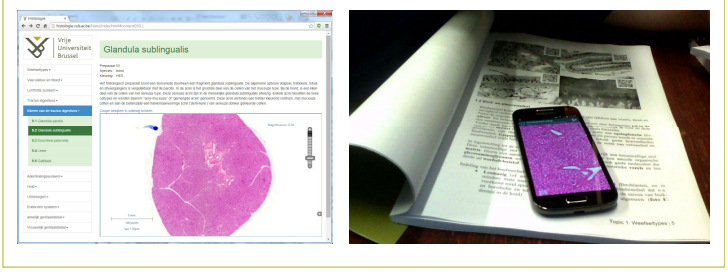
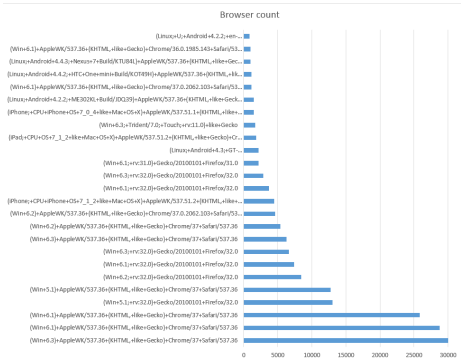


Figure 2





Discussion & conclusion

We think that digital pathology can significantly augment enclosed information in tissue repositories. Facilitating biobanks are a novel application for digital pathology. A biobank is a means to facilitate (retrospective) research and foster collaboration. Oftentimes there is reluctance to request material because there is too high a degree of uncertainty about its quality and properties. Through digital pathology enhancement this uncertainty can be removed and the fidelity of the biobank increases significantly. before requesting a tissue sample, a PI may examine a representative slide of the sample and decide whether he really wants it or not. Digital pathology improves the fidelity of the material in the biobank, increases the use of the contained material, and justifies the investment in the biobank itself.