COMPUTER AIDED NAVIGATION – VIRTUAL MICROSCOPY AS A TOOL FOR BLOCK CENTRIC SLIDE READING

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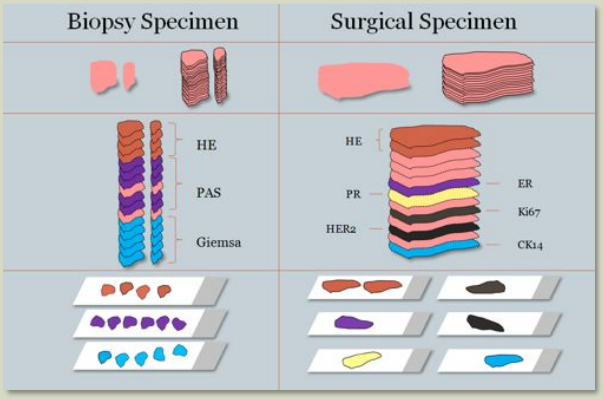
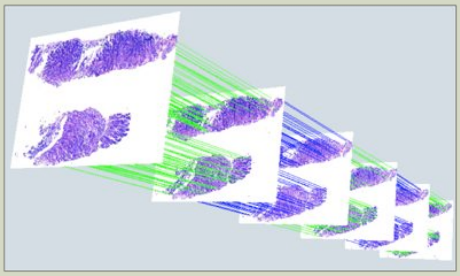
OUTLINE

- Background
- Material and Methods
- Results
- Conclusions

BACKGROUND

- Diagnostics frequently requires inspection of identical histological structures in different sections
- Conventional microscopes are à priori and virtual are de facto slide-centric
- Diagnosis is case and thereby at least block-cetric





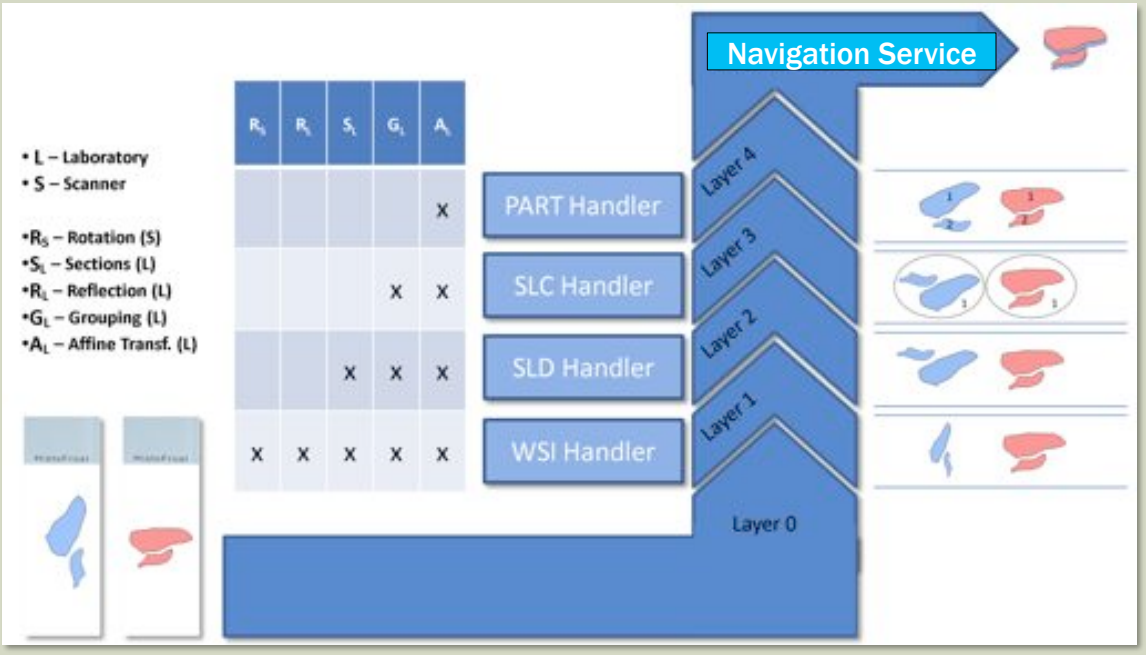
MATERIAL AND METHODS

- Transformationprocesses
- Interconnection Model
- Feature based registrierung
- Navigation service
- Visualization

TRANSFORMATIONPROCESSES (PIXEL)

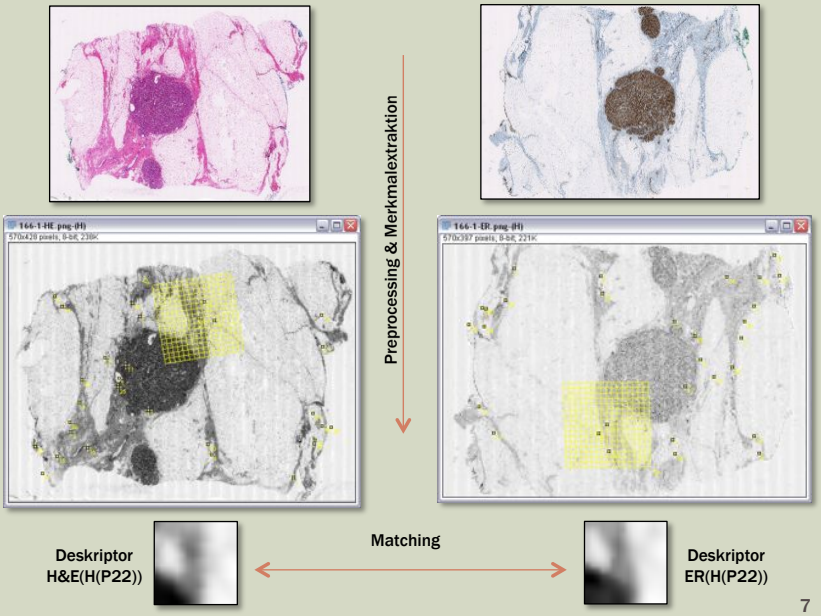
Transformation	Origin	Type	Impact	Preventability	Relevance for navigation
Free rotation	AP-Lab	global / local	High	No	++
Rotation (90°/180°/270°)	Scanner	global	High	No	++
Translation	AP-Lab, Scanner	global / local	Medium	No	++
Reflection	AP-Lab	global	High	Yes	++
Distortion	Clinic, AP-Lab, Scanner	global / local	Low	No	+
Elastic distortion	Clinic, AP-Lab, Archive	local	Low	No	0
Separation	AP-Lab	local	High	Yes	++
Elemination	AP-Lab	local	High	Yes	++
Overlapping	AP-Lab	local	Medium	Yes	++
Free transformatiion	Clinic, AP-Lab, Archive, Scanner	global / local	High	No	+

INTERCONNECTION MODEL



FEATURE BASED REGISTRATION

- Feature Extraction & Matching
- Automatic validation using RANSAC [1]
- Manual refinement possible



[1] Fischler M.A., et al. Random Sample Consensus: A Paradigm for Model Fitting with Applications to Image Analysis and Automated Cartography. Comm of the ACM 06/1981, 24 (6), 381-395.

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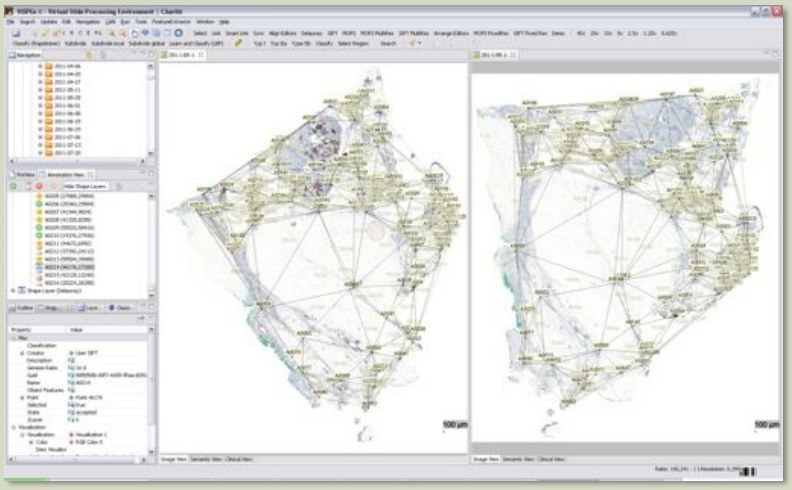

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NAVIGATION SERVICE

- Data model
- Transformations
- Query Interface


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- <WsiRefPairs>
  - <metadata>
      <version rev="1.5" />
      <creator userID="zerben" />
      <imgHandlerUri name="http://vss-stor.charite.de/wsihandler" />
      <wsiFolder name="published" />
      <imagePath name="Misc/Reg" />
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      <slide2 id="" name="239-1-betaHCG-1" ext="vsf" offsetX="0" offsetY="0" width="24320" height="31744" />
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    - <ref id="0">
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    + <ref id="8">
    + <ref id="9">
    + <ref id="10">
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</WsiRefPairs>
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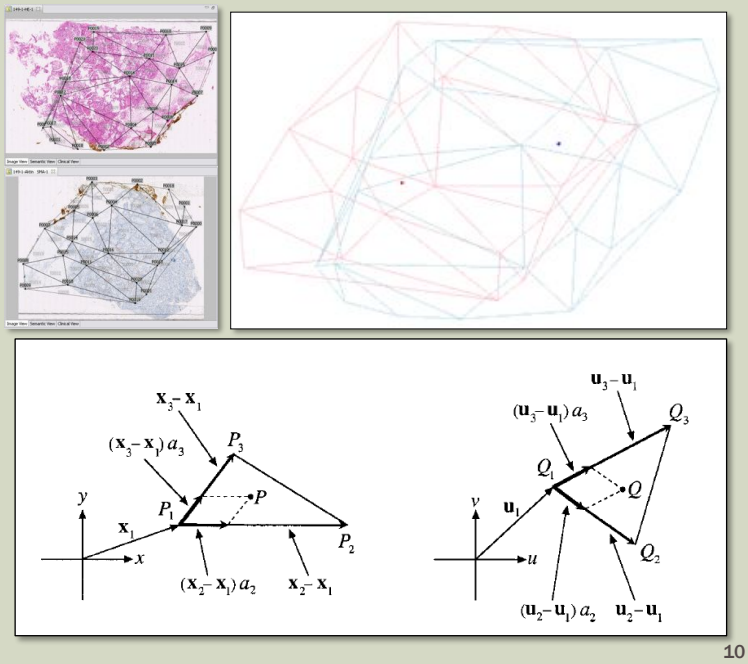

NAVIGATION SERVICE

- Data model
- Transformations
- Query Interface

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.../sldnavsvc/SlideNavi.ashx?
cmd=getPos&
wsiFolder=demo&
srcSlide=149-1-p63-1&
srcX=50000&
srcY=50000&
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```

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srcR=64.0&
dstSlide=149-1-HE-1
```

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  </xml>
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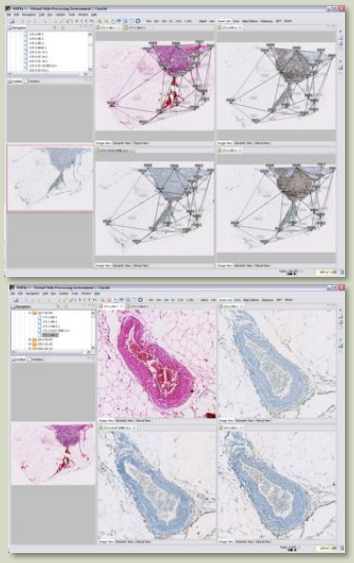
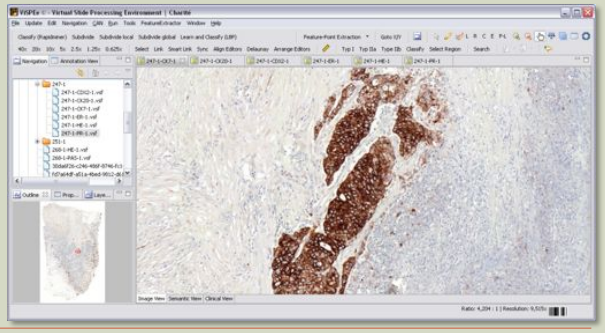
VISUALIZATION

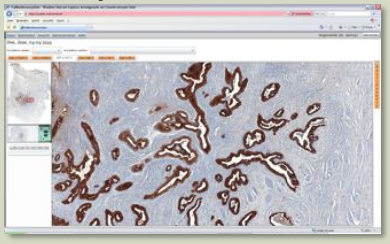
- Parallel



- Sequential

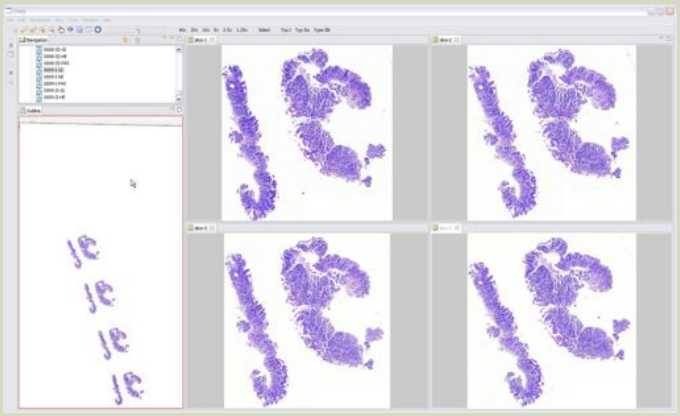


- Transparent



RESULTS

- Slide Provider System (Interconnection Model)
- Slide Navigation Webservice (point co-location service)
- Sample implementations
  - **Development environment**
  - AndroScope
  - Tumor board meeting system



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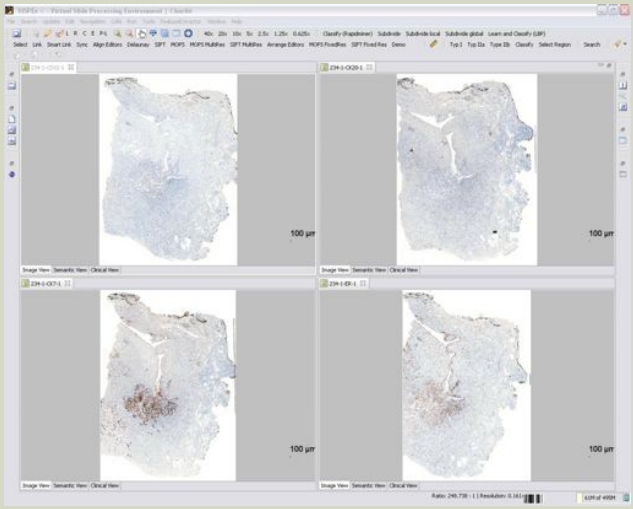

CONCLUSIONS

- Registration of consecutive sections can be pre-processed and persisted
- Saving of time for navigation between different stains/markers
- Framework enables inspection of tissue section independent of lab- and scanner based transformations
- Additional benefit for diagnostics by utilization of computer aided navigation for block-centric slide reading

Thank you very much for your attention!

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