Meeting abstract
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Present Status and Future Aspects of Telepathology, Focussing on Integrated Artificial Intelligence Systems

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BACKGROUND: *Telepathology has now left its childhood, and several institutes of pathology are using this technology, either for fast frozen section services (active telepathology), or expert consultation (passive telepathology). An appropriate application of both techniques is closely associated with adequate sampling procedures, and, in addition, with selective use of diagnostic important features. These parameters can be handled by application of artificial intelligence systems (AI).*

THEORY AND TELEPATHOLOGY STATUS: *Any tissue sampling technique depends upon the proposed aim, for example to obtain the most significant diagnosis with the lowest effort, or to collect morphometric features representative for the whole spectrum of diagnoses. Thus, sampling techniques can roughly be divided into stratified and random sampling. Stratified sampling has been specifically analyzed by geologists (Kriging), is, however, fairly unknown to pathologists. Random sampling requires a knowledge of the whole space (area) under consideration, and an estimate of properties and their distribution of features to be measured. In diagnostic pathology, both techniques can be used at different magnifications, and can be combined with so-called structures of different orders. These features can be fed into AI systems, which can give appropriate estimates after a learning phase. Using telepathology, several institutions can fed cases and associated features in AI systems, thus providing the essential data base for further efficient application.*

PRELIMINARY RESULTS: *Simulation of sampling techniques with histological and cytological slides revealed that efficient sampling procedures requires 3 - 4 different magnifications, and a transmission of 4 - 10 images each. The scanning procedure can be divided into a) definition of potential areas with competent information (CI, low magnification), b) confirmation of location of interest (LI, moderate magnification), and c) selection of areas useful for definite diagnosis (DD, high magnification). A fast analysis of gray value distribution can be used for measuring the CI, syntactic structure analysis for LI, and morphometric measurements (DNA analysis, etc.) for DD. These systems require active telepathology for implementation into a telepathology network. In addition, the selected features can be handled by passive telepathology when AI systems such as neuronal networks or Bayesian decision systems are used.*

CONCLUSION: *The spread of telecommunication networks in pathology will soon or later require adequate tools for data handling and control. They should be able to dynamically select adequate features useful for diagnostic assistance. These include stratified sampling procedures and AI systems for dynamic selection and transfer of appropriate information. The combination of AI systems with telecommunication offers new and promising aspects for diagnostic, educational, and research purposes.*

KEY WORDS: *Telemedicine; Telepathology; Artificial intelligence systems*

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