

The development of practical image quality evaluation method for whole slide imaging scanner

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海外における研究活動状況

研究目的

The objective of my visit was to implement the quality evaluation method for the practical use in the hospital. I fulfilled the primary goal and additionally developed an automatic HER2 gene amplification quantification method for invasive ductal breast cancer.

海外における研究活動報告

During my visit to Memorial Sloan Kettering Cancer Center (MSKCC) in New York, I have implemented the image quality evaluation method and evaluated qualities for several images. Moreover, I have presented my work of image quality evaluation in “Digital Pathology and AI Congress” conference in New York, USA. I have received comments from the pathologists and experts during that conference which gave the idea for further improvements for the practical implementation of the system. One important finding is to apply color standardization before evaluating the quality of the image. Currently, I am working on it and

trying to integrate the color standardization process with the quality evaluation method. Beyond the quality evaluation, the MKSCC hospital authorities assigned me a new task to identify the status of invasive ductal breast carcinoma (IDC) for proper prognosis and targeted therapy using digital image analysis techniques. This cancer detection method will be integrated with the quality evaluation prototype system. The quantification of invasive ductal breast cancer will be performed using the whole slide images after evaluating the quality of the using the equality evaluation method.

Breast cancer is the second leading cause of cancer death in women. Invasive ductal breast cancer is the most common type of breast cancer which is about 80% of all breast cancers. However, the rate of death can be reduced significantly, if it is possible to detect cancer in the early stages and the proper prognosis is exercised. For the decision of proper prognosis and targeted therapy, it is necessary to assess the status of IDC for the decision of prognosis and targeted therapy. Currently, this assessment is done manually by the pathologists by observing

the glass slides through the eyepiece of the traditional light microscope. HER2 (human epidermal growth factor receptor 2) gene amplification is an established way to assess the IDC but performed manually by the pathologists, currently. This manual assessment is not consistent and reliable. Therefore, it is necessary to detect the biomarkers signal automatically and quantify the status of cancer. We propose a method to automatically assess the status of invasive ductal breast cancer by quantifying the HER2 gene amplification using the chromogenic in situ hybridization (CISH) whole slide images for the proper diagnosis.

During my stay in MSKCC, I have performed several experiments to develop the method that can enumerate the HER2 (human epidermal growth factor receptor 2) gene signal and CEP17 (chromosome enumeration probe 17) signal from cancer affected nuclei to quantify the HER2 gene amplification. I used CISH images and utilized digital image analysis techniques for this work. 13 Cases were used for the experiments and the results produced by the developed method was compared with the clinical data. The clinical data was prepared by the pathologists and experts. We found a strong correlation with the results of the

automatic quantification method for all cases. The strong correlation ensures the accuracy of the proposed automatic quantification method. However, further experiment and evaluation are required to use the method for practical use in the hospital. I also developed GUI application for using the quantification method in the hospital for pathologists and experts. Further, I have received some comments and suggestions regarding the user interface of the application to update. I am working on it as well. Additionally, the pathologists trained me how to observe and identify the invasive breast cancer using the glass slide and light microscope.

Currently, I am trying to publish a paper with the obtained results regarding the automatic quantification of IDC work in a medical conference in USA (<https://www.uscap.org/education/2019-abstract-guidelines>).

この派遣の研究成果等を発表した
著書、論文、報告書の書名・講演題目

- 1) Already presented my work in a conference in USA called digital Pathology & AI Congress: USA 2018 (<http://www.global-engage.com/event/digital-pathology-usa/>)
- 2) I am about to publish a paper in a journal (<https://www.spiedigitallibrary.org/journals/journal-of-medical-imaging?SSO=1>)