Anonymization of 3D medical imaging patient data for large multi-center trials

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Number of students in this project: 1

Objective: Large multi-center trials are a powerful tool to investigate new surgical methods and/or treatment options. The power of such trials is the large number of participating patients, which can involve hundreds of patients. However, often such trials require researchers to manage and evaluate a large amount of patient data. To protect the patients' identity and privacy, these data are used without any identifying marks. This is especially important for imaging data, such as Computer Tomography (CT) and Magnetic Resonance Imaging (MRI).

To allow sharing such medical images taken with devices from different manufactures, a DICOM (Digital Imaging and Communications in Medicine) standard was developed. This standard provides a uniform format for medical imaging images, which beside the image information contains additional data, such as patient name, birthdate, time of image taken, etc. For anonymous use of these image data, a new DICOM file needs to be created, in which all identifying information in the file are replaced with non-identifying data.

There are a number of commercial and non-commercial software tools (DicomWorks, etc.) which already provide this functionality. Furthermore, hospitals, such as the Kingston General Hospital, provide services for anonymization of image data. However, these exciting tools often are not useful for the purpose of large research studies. They are often designed to anonymize only single patient-datasets at the time, and are therefore very time-consuming to use in studies which require to remove identifying marks from a large number of datasets. Additionally, they are missing important flexibility, such as setting the desired values for the anonymized fields. Last but not least, available tools are often error prone and leave identifying marks in the datasets. Researchers have responsibility to ensure that the patients' rights are protected to the best of their knowledge. Therefore, goal of this project is to develop a safe and efficient software method to anonymize large sets of 3D patient imaging data, such as CT and MRI data.

Methods: The student will design software requirements and specifications based on various user inputs. A prototype of the proposed software method will be developed and tested using a set of 3D image data. Finally, a small user study will be performed in which a research assistant will test the software prototype and evaluate the complete removal of any identifying patient information, as well as compare the user friendliness and time requirements between a conventionally used method and the newly developed method.

Outline of students' role: (1) Work in a multidisciplinary technology research team specialized in computer- assisted surgery. (2) Learn concepts of DICOM standard; (3) Review third-party libraries for reading/manipulating and saving DICOM files; (4) Develop prototype software for image management and anonymization (on Windows); (5) Perform user study.

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