**Project for Master Thesis  
Title: “Software implementation of the quality assurance tool for magnetic resonance imaging distortion assessment”  
@ Div. of Medical Radiation Physics, Dept. of Radiation Oncology, Medical Univ. Vienna / AKH Wien**

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**Motivation for the project:**

The importance of magnetic resonance imaging (MRI) for image guided radiotherapy is continuously increasing. MRI shows great benefits compared to X-ray based imaging methods, such as superior soft tissue contrast and no additional exposure to patients for repeated imaging. It is being used for targets and organs at risk delineation and its usefulness in so called MR-only radiation therapy protocols is being widely investigated. Also, it is more and more widely utilized for the assessment of the early treatment response. Unfortunately the MRI systems are prone to various disruptions that may cause distortions of the acquired images. Unlike in radiology, the exact spatial projection of human anatomy plays the pivotal role in radiation oncology, therefore the MRI systems used for treatment planning and assessment need to be quality assured with regards to the spatial distortion of the produced images.

**Physical background:**

A customized MRI image distortion phantom have been designed and manufactured for our open bore, C-arm magnetic resonance scanner. To measure the MRI spatial distortion, the MR images of the phantom need to be compared with its CT reference images. Image intensity profiles measure along chosen, multiple axis of the phantom have to be plotted for MR and CT images and automatically compared to detect eventual distortion.

**Aim of this master thesis is the development and implementation of a method for fast assessment of the spatial MR image distortion using a customized phantom.**

**Master – Thesis Outline:**

* **Project work:** acquiring MR and CT images of simple structures of the customized phantom, as well as the implementation of the image intensity profiles comparison (CT-MRI) algorithm for a simple 2D object
* Implementation of the image intensity profiles comparison (CT-MRI) algorithm for a 3D object
* Implementation of the image intensity profiles comparison (CT-MRI) algorithm for an array of 3D objects (in multiple dimensions
* Implementation of additional image similarity measures
* Implementation of the combined toolkit in an user-friendly GUI (Matlab or SlicerRT)
* Validation of the MR images distortion quality assurance tool

**Duration:** 4-8 months (depending on the software implementation performance), the position is open immediately from 05/2016

This Master thesis requires a good working knowledge of Matlab.

**Who should apply?** Motivated students with a completed B.Sc. in Technical Physics, Informatics or Biomedical Engineering from Austria or abroad.

**What can we offer?** Collaboration in a great, international, enthusiastic and high level research oriented team

If you are interested in the topic please send an E-mail to [piotr.andrzejewski@meduniwien.ac.at](mailto:piotr.andrzejewski@meduniwien.ac.at) or [dietmar.georg@meduniwien.ac.at](mailto:dietmar.georg@meduniwien.ac.at)