Image Processing & Analysis in Diagnostic Imaging
Assignment 3

Kumar Punithakumar, University of Alberta October 30, 2018

1 Image Registration

For this assignment, please use RealTTracker software. The Windows version of the software is included in the assignment. The software can be downloaded from the following link: http://bsenneville.free.fr/RealTITracker/ for linux based systems. Implement a registration based segmentation approach to delineate the right ventricle using the following instructions:

- The following cardiac images are provided with this assignment:
  - `P01-0100.dcm`: The MRI image at the end-diastolic phase
  - `P01-0108.dcm`: The MRI image at the end-systolic phase
- Please use `P01-0108.dcm` as the reference image and `P01-0100.dcm` as the template image and perform image registration using RealTTracker software.
- Display the images and motion field using `display_result2D()` function included in the RealTTracker.
- The manual labellings correspond for endocardium and epicardium for `P01-0100.dcm` are given by `P01-0100-icontour-manual.png` and `P01-0100-ocontour-manual.png` files respectively.
- Use the RealTTracker software to deform manual labelling to find endocardial and epicardial segmentation at end-diastolic phase, i.e., `P01-0108.dcm` (Hint: You do not have to implement the transformation function. You can use `RTTrackerWrapper()` to compute the deformed manual labelling).
- Compute precision, recall, Dice score, and Hausdorff distance between the segmentations obtained using RealTTracker and the ground truth labels given by `P01-0108-icontour-manual.png` (endocardium) and `P01-0108-ocontour-manual` (epicardium).
- Report the results for both L2L2 and L2L1 optical flow algorithms (Please refer to the `test_RTTracker_2D()` function for more details).

1.1 Grading (Total = 10 marks)

- A report containing implementation details, parameter setting, figures showing the motion field and other outputs: **6 marks**
- Report the results for all evaluation metrics used for the validation: **2 marks**
- Source code for the implementation: **2 marks**

1.2 Submission

You are required to submit the following files for this assignment:

1. A report containing the information mentioned above
2. The source code of the program
3. A README file containing details on how to run the code and other information such as Python/MATLAB/C++ module version used for writing the code.

Place your files in a single directory. Zip and submit the file via email to punithak@ualberta.ca on or before November 20, 2018. A penalty of 10% (*i.e.,* 1 mark) per day will be applied for late submissions.