Folder and File Naming Scheme for Organizing pCT Data Directory

Bold and Underlined : Folder names

Bold and Italic : File names

(1) **Object Name** : folder containing all of the experimental/simulated data and reconstructed images associated with the object with this name.

- **(a)** **Reference_Images** : folder containing reference images (xCT, RSP, etc) relevant to analysis/comparison of the data/images for this object and data type.
- **(b)** **Experimental** : folder containing data and images generated from an experimental scan of the object.
  - **(i)** **YY-MM-DD** : folder containing data and reconstructed images corresponding to all experimental scans of the object performed on this date.
    - **(1)** **XXXX[_AAA]** : folder containing data and reconstructed images corresponding to the experimental scan of the object for this particular run # of this date, where the run # is of the form "*XXXX*" with an optional descriptor tag "*_AAA*" added specifying additional pertinent information about the scan, such as inferior "*_Inf*" or superior "*_Sup*" positioning as in the case of a head phantom.
      - **(a)** **Input** : folder containing raw data generated by scan of object from each gantry angle and transmitted by event builder.
        - **(i)** ***raw_xxx.bin*** : binary files containing trigger/tracker/energy detector data from event builder associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$}.
      - **(b)** **Output** : folder containing calibration and post processed data generated from analysis of raw data and used as input to image reconstruction.
        - **(i)** **YY-MM-DD** : folder containing the post processed "*projection_xxx.bin*" data generated on this date and the reconstructions using this data.
          - **(1)** ***calib.txt*** : text file containing calibration curve coefficients for WEPL calibration.
          - **(2)** ***TVcalib.txt*** : text file containing calibration curve coefficients for tv corrected WEPL calibration.
          - **(3)** ***settings.cfg*** : specifies scan properties such as gantry angle interval, t/v detector size, reconstruction volume dimensions, etc and initial settings to use for preprocessing/reconstruction.
          - **(4)** ***projection_xxx.bin*** : binary files containing tracker coordinates and WEPL data associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$} converted from raw data using tracker alignment, track reconstruction, and WEPL calibration routines and used as input to image reconstruction.
          - **(5)** **Reconstruction** : folder containing preprocessed data and reconstructed images generated using the "*projection_xxx.bin*" data along with reference images relevant to the object.
            - **(a)** **YY-MM-DD** : folder containing the preprocessed data generated on this date and the reconstructed images generated from this data.
              - **(i)** ***settings_log.cfg*** : copy of ***settings.cfg*** with any changes made to parameters/options applied at execution, if any.
              - **(ii)** ***execution_times.txt*** : execution times for various portions of preprocessing and/or reconstruction and total program execution time.

(iii) ***bin_counts.txt*** : linearized bin # for each proton history, where linearized bin # = t_bin + angle_bin * T_BINS + v_bin * T_BINS * ANGULAR_BINS.

(iv) ***mean_rel_ut_angle.txt*** : mean relative ut angle ($\angle ut_{out} - \angle ut_{in}$) by linearized bin #.

(v) ***mean_rel_uv_angle.txt*** : mean relative uv angle ($\angle uv_{out} - \angle uv_{in}$) by linearized bin #.

(vi) ***mean_WEPL.txt*** : mean WEPL value by linearized bin #.

(vii) ***stddev_rel_ut_angle.txt*** : standard deviation of the relative ut angle ($\angle ut_{out} - \angle ut_{in}$) by linearized bin #.

(viii) ***stddev_rel_uv_angle.txt*** : standard deviation of the relative uv angle ($\angle uv_{out} - \angle uv_{in}$) by linearized bin #.

(ix) ***stddev_WEPL.txt*** : standard deviation of the WEPL value by linearized bin #.

(x) ***sinogram.txt*** : mean WEPL after statistical cuts with the t_{bin} and angular bin θ_{bin} plane for each vertical bin v_{bin} stacked on each other.

(xi) ***hull.txt*** : text file specifying hull in 1s/0s with the xy plane for each slice stacked on each other.

(xii) ***FBP.txt*** : text file specifying filtered back projection image with the xy plane for each slice stacked on each other.

(xiii) ***x_0.txt*** : text file specifying voxel values of initial iterate with the xy plane for each slice stacked on each other.

(xiv) ***sin_table.bin*** : file containing the tabulated values of sine function

(xv) ***cos_table.bin*** : file containing the tabulated values of cosine function

(xvi) ***coefficient.bin*** : file containing the tabulated scattering coefficient values for Σ_1/Σ_2 for $u_2 - u_1/u_1$ values

(xvii) ***poly_1_2.bin*** : file containing the tabulated MLP polynomial values with coefficients $\{1, 2, 3, 4, 5, 6\}$

(xviii) ***poly_2_3.bin*** : file containing the tabulated MLP polynomial values with coefficients $\{2, 3, 4, 5, 6, 7\}$

(xix) ***poly_3_4.bin*** : file containing the tabulated MLP polynomial values with coefficients $\{3, 4, 5, 6, 7, 8\}$

(xx) ***poly_2_6.bin*** : file containing the tabulated MLP polynomial values with coefficients $\{2, 6, 12, 20, 30, 42\}$

(xxi) ***poly_3_12.bin*** : file containing the tabulated MLP polynomial values with coefficients $\{3, 12, 30, 60, 105, 168\}$

(xxii) ***MLP.bin*** : binary file with MLP path data for each history entering hull.

(xxiii) ***WEPL.bin*** : binary file specifying WEPL value for each history entering hull.

(xxiv) ***histories.bin*** : binary file specifying entry/exit coordinates/angles, bin number, gantry angle, and hull entry x/y/z voxel # for each history entering hull.

(xxv) **Images** : folder containing reconstructed images generated using this preprocessed data.

(1) **YY-MM-DD** : folder containing the reconstructed images generated on this date using the preprocessed data above.

(a) ***x_k.dcm*** : DICOM images of x after k iterations.

(b) ***x_k.txt*** : text images of x after k iterations.

(c) ***x_k.png*** : PNG images of x after k iterations.

(c) **Simulated** : folder containing data and images generated from a simulated scan of the object.

(i) **G_YY-MM-DD** : folder containing data and reconstructed images corresponding to all GEANT4 simulated scans of the object generated on this date.

(1) **XXXX[_AAA]** : folder containing data and reconstructed images corresponding to the experimental scan of the object for this particular run # of this date, where the run # is of the form "*XXXX*" with an optional descriptor tag "*_AAA*" added specifying additional pertinent information about the scan, such as inferior "*_Inf*" or superior "*_Sup*" positioning as in the case of a head phantom.

- (a) **Input** : folder containing raw data files generated by simulated scan of object for each gantry angle.
  - (i) ***raw_xxx.bin*** : binary files containing trigger/tracker/energy detector data from event builder associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$}.
- (b) **Output** : folder containing calibration and post processed data generated from analysis of raw data and used as input to image reconstruction.
  - (i) **YY-MM-DD** : folder containing the post processed "*projection_xxx.bin*" data generated on this date and the reconstructions using this data.
    - (1) ***calib.txt*** : text file containing calibration curve coefficients for WEPL calibration.
    - (2) ***TVcalib.txt*** : text file containing calibration curve coefficients for tv corrected WEPL calibration.
    - (3) ***projection_xxx.bin*** : binary files containing tracker coordinates and WEPL data associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$} converted from raw data using WEPL calibration routine and used as input to image reconstruction.
    - (4) **Reconstruction** : folder containing preprocessed data and reconstructed images generated using the "*projection_xxx.bin*" data along with reference images relevant to the object.
      - (a) **YY-MM-DD** : folder containing the preprocessed data generated on this date and the reconstructed images generated from this data.
        - (i) ***hull.txt*** : text file specifying hull in 1s/0s.
        - (ii) ***FBP.txt*** : text file specifying filtered back projection image.
        - (iii) ***x_0.txt*** : text file specifying voxel values of initial iterate.
        - (iv) ***MLP.bin*** : binary file with MLP path data for each history entering hull.
        - (v) ***WEPL.bin*** : binary file specifying WEPL value for each history entering hull.
        - (vi) ***histories.bin*** : binary file specifying entry/exit coordinates/angles, bin number, gantry angle, and hull entry x/y/z voxel # for each history entering hull.
        - (vii) **Images** : folder containing reconstructed images generated using this preprocessed data.
          - (1) **YY-MM-DD** : folder containing the reconstructed images generated on this date using the preprocessed data above.
            - (a) ***x_k.dcm*** : DICOM images of x after k iterations.
            - (b) ***x_k.txt*** : text images of x after k iterations.
            - (c) ***x_k.png*** : PNG images of x after k iterations.

(ii) **T_YY-MM-DD** : folder containing data and reconstructed images corresponding to all TOPAS simulated scans of the object generated on this date.

(1) **XXXX[_AAA]** : folder containing data and reconstructed images corresponding to the experimental scan of the object for this particular run # of this date, where the run # is of the form "*XXXX*" with an optional descriptor tag "*_AAA*" added specifying additional pertinent information about the scan, such as inferior "*_Inf*" or superior "*_Sup*" positioning as in the case of a head phantom.

- (a) **Input** : folder containing raw data files generated by simulated scan of object for each gantry angle.

- **(i)** ***raw_xxx.bin*** : binary files containing trigger/tracker/energy detector data from event builder associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$}.

(b) **Output** : folder containing calibration and post processed data generated from analysis of raw data and used as input to image reconstruction.

- **(i)** **YY-MM-DD** : folder containing the post processed "*projection_xxx.bin*" data generated on this date and the reconstructions using this data.
  - **(1)** ***calib.txt*** : text file containing calibration curve coefficients for WEPL calibration.
  - **(2)** ***TVcalib.txt*** : text file containing calibration curve coefficients for tv corrected WEPL calibration.
  - **(3)** ***projection_xxx.bin*** : binary files containing tracker coordinates and WEPL data associated with gantry position "*xxx*" = {"*001*", "*002*", "*003*", $\cdots$} converted from raw data using WEPL calibration routine and used as input to image reconstruction.
  - **(4)** **Reconstruction** : folder containing preprocessed data and reconstructed images generated using the "*projection_xxx.bin*" data along with reference images relevant to the object.
    - **(a)** **YY-MM-DD** : folder containing the preprocessed data generated on this date and the reconstructed images generated from this data.
      - **(i)** ***hull.txt*** : text file specifying hull in 1s/0s.
      - **(ii)** ***FBP.txt*** : text file specifying filtered back projection image.
      - **(iii)** ***x_0.txt*** : text file specifying voxel values of initial iterate.
      - **(iv)** ***MLP.bin*** : binary file with MLP path data for each history entering hull.
      - **(v)** ***WEPL.bin*** : binary file specifying WEPL value for each history entering hull.
      - **(vi)** ***histories.bin*** : binary file specifying entry/exit coordinates/angles, bin number, gantry angle, and hull entry x/y/z voxel # for each history entering hull.
      - **(vii)** **Images** : folder containing reconstructed images generated using this preprocessed data.
        - **(1)** **YY-MM-DD** : folder containing the reconstructed images generated on this date using the preprocessed data above.
          - **(a)** ***x_k.dcm*** : DICOM images of x after k iterations.
          - **(b)** ***x_k.txt*** : text images of x after k iterations.
          - **(c)** ***x_k.png*** : PNG images of x after k iterations.

(1) **raw_data** : folder containing the raw experimental data organized by scan date

- **(a)** **YY-MM-DD** : Folder containing all raw experimental data acquired from the scan beginning on **YY-MM-DD**
  - **(i)** *<object>_XXXX[_AAA]_xxx.dat* : raw experimental data for the object named "*<object>*", from run # "*XXXX[_AAA]*", where "*XXXX*" is a 4 digit # with leading zeros and "*_AAA*" is an optional descriptor tag, and "*xxx*" is the gantry angle at which the data was acquired.

(2) **processed_data** : folder containing the processed experimental data organized by scan and processed dates

- **(a)** **YY-MM-DD** : Folder containing all processed experimental data corresponding to the raw experimental data acquired on **YY-MM-DD**
  - **(i)** **YY-MM-DD** : Folder containing all processed experimental data generated on **YY-MM-DD** from the raw data
    - **(1)** *<object>_XXXX[_AAA]_xxx.dat.root.reco.root.bin* : processed experimental data with tracker coordinates, recovery of missing hits when possible, and calibrated WEPL measurements for the object named "*<object>*", from run # "*XXXX[_AAA]*", where "*XXXX*" is a 4 digit # with leading zeros and "*_AAA*" is an optional descriptor tag, and "*xxx*" is the gantry angle at which the data was acquired.