New Diagnostic Tool (updated_gen_diagnostics.m)

The main new function for diagnostics is

[output_struct, all_section_maps] = updated_gen_diagnostics(rcsource, rc, point_matches, zstart, zend, options)

This function takes in a source renderer collection (rcsource), the renderer collection of interest (rc), point match collection(s) (point_matches), zstart, zend and options; it returns output_struct with information about the areas, perimeters and residuals for rc for the zs of interest, as well as the optional output all_section_maps (used to plot tiles).

The options are below:
```
options.dir_scratch = '/scratch/ackermand';
options.xs_weight = 0.5;
options.min_points          = 10;
options.max_points          = 100;
options.number_of_cross_sections = 2;
options.show_residuals = false; % Show_residuals and show_deformations are
for plotting section maps
options.show_deformations = false;
options.show_table = false; % Whether or not to show the table
options.output_data_per_tile = false; % Store all the data per tile (eg.
residuals, area, area ratio etc) or not
options.outlier_deviation_for_ratios = 0.10; % Cutoff for area ratio and
perimeter ratio outliers: any tile ratios that stray by more than
outlier_deviation_for_ratios*100% are outliers. If an array of two values is
provided, then the first and second values are taken to be the lower and
upper cutoff ratios, respectively.
options.outlier_deviation_for_residuals = 10; % Cutoff average residual for
tile, beyond which it is considered to be an outlier
```

updated_gen_diagnostics is subdivided into three main functions each of which is used to calculate information about the sections and can be called independently if desired.

Area and Perimeter Ratios (calculate_area_and_perimeter_ratios.m)

This function divides the tile areas and perimeters from rc by the corresponding tile areas and perimeters from rcsource. If a tile's area or perimeter ratio varies by more than options.outlier_deviation_for_ratios, then the tile is considered an outlier due to deforming too much. output_struct.Area and output_struct.Perimeter will then contain information about the area and perimeter ratios (including medians, means, variances, outlier count, percent of tiles that are outliers and the outlier tile ids) for each section. If options.output_data_per_tile is true, then per-tile information is also included in the output_struct fields including the actual areas, perimeters and ratios for each tile, as well as the outlier indices. If rcsource is empty ([]) when calling updated_gen_diagnostics, then area and perimeter calculations will be skipped and only residuals will be calculated.

Montage Residuals (calculate_montage_point_match_residuals.m)

For each section, montage point match residuals are calculated. A tile's montage residual is taken to be the mean residual (point match distance) between it and all the tiles it shares point matches with. If a tile's mean residual exceeds options.outlier_deviation_for_residuals, then it is considered an outlier since it does not fit well in the section. As with Area and Perimeter, output_struct.MontageResiduals will contain section by section information about the montage residuals (including the median of tile means, the mean of tile means, the variance of tile means, the outlier count, outlier percentage, outlier tile ids, the number of unconnected tiles and the unconnected tile ids). If options.output_data_per_tile is true, then per tile information is included in the output_struct.MontageResiduals, including the tile-tile pair residuals, the outlier tile indices and unconnected tile indices.

Cross Section Residuals (calculate_cross_section_point_match_residuals.m)
In addition to intrasection residuals, cross-section residuals are also calculated. A tile's mean cross section residual is the average point match distance between it and all tiles it shares point matches with in another given section. The cross section residual between two sections is the median of these tile means. In particular, cross section residuals are calculated between a given section and up to +/- options.number_of_cross_sections (so by default, cross section residuals are calculated between a section and the two above and below it). output_struct.CrossSectionAndMontageResidualsMatrix is the (zend-zstart) by (zend-zstart) matrix of cross section residuals where the (*n*,*m*) element of the matrix corresponds to the cross section residuals between the *n*th and *m*th sections; the main diagonal elements correspond to the montage residuals.

Summary Table
The final field in output_struct is a table summarizing the above information.

Visualizing Data

Visualization options are also available. For instance, if options.show_deformations or options.show_residuals is true, then maps of each section can be provided:
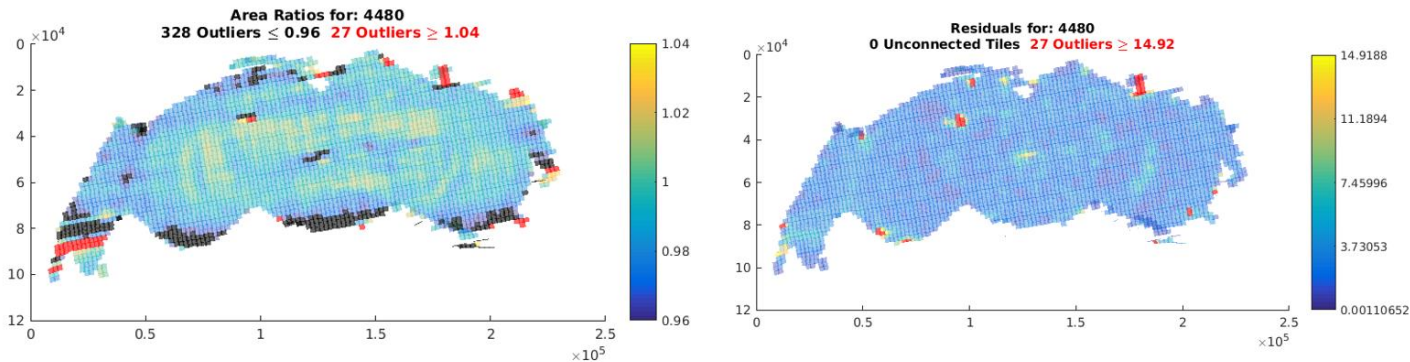
Template

An example template for running the diagnostics is provided in /level_1/updated_diagnostics/test_diagnostics.m, including plotting the residuals in a useful way to compare two different renderer collections, eg:
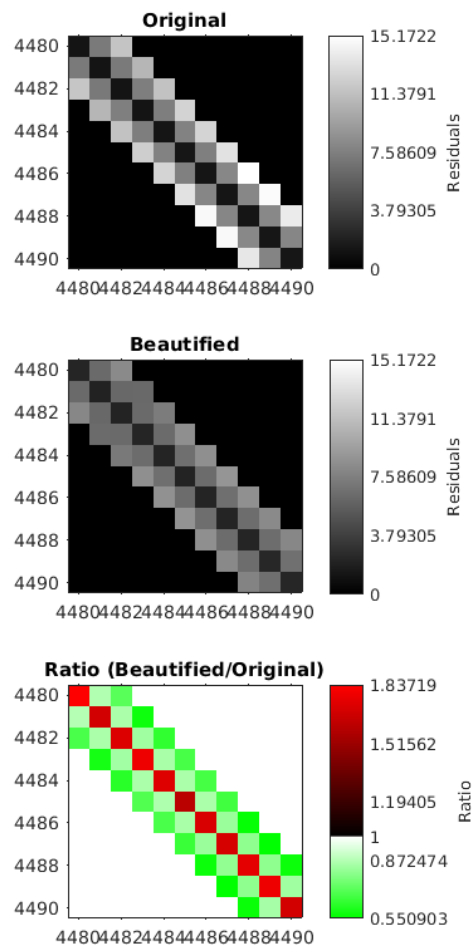
Here, green corresponds to improved (smaller) residuals and red to worse (larger) residuals.