

Tasks

The following tasks are to be accomplished as group work within assignment 4 of this block until 30.10. 2020, 9:00:

1. Continue implementing and testing your algorithm. Make it robust i.e., less sensitive w.r.t. outliers, by taking appropriate precautions during data preparation and by including outlier detection and suppression in the parameter estimation using the Danish method. Extend the method and/or the preprocessing of the data such that the algorithm can also deal with individual extremely large outliers (e.g. a m-level error of two observations resulting from wrong point association).

Create test data with outliers by editing manually some of the ASCII coordinates in the scan-files which are part of the test data supplied so far.

2. Finalize the algorithm and Matlab implementation for estimation of the 4 APs and all EOs (6 per scanner setup) as described in the previous assignments. Pay special attention to documentation and clear formatting of the code (comments, indenting, ...), and inclusion of a help section at the beginning of each Matlab file (such that calling "help *functionname*" displays this information in the Matlab command window) indicating the purpose and the most important aspects of the use of the respective function or script. Use the style and type of information as given with standard Matlab functions (e.g. as displayed when calling "help plot").
3. Two datasets will be provided in the zip file PPE_FinalData.zip (each dataset stored in a different directory within the zip-file) on Oct 23. The OP coordinates are assumed to be fixed (i.e., perfectly known and without deviations), the scanner observations are assumed to have standard deviations of 2 mm for range and 0.005 deg for angles. Process these data using your software, ideally not making any modifications any more to the software but just critically assessing the results (including quantities which may indicate the quality of the data and results).
4. Describe the mathematical model chosen for scanner calibration (deviations as function of observables; you can refer to the paper by Lichti and just report differences/restrictions or report the full equations), the software architecture, the outlier detection procedure, the main functions (list or table of names and purpose of these functions), and the results of the calibration based on each of the two data sets (separately). List any observations removed as outliers. Give the estimated values of the APs and EOs for both data sets. Critically assess/discuss the results in terms of (i) significance of the parameters, (ii) their impact on the corrected measurements (how large are the corrections as compared to the standard deviations of the scanner?), (iii) correlations (are the correlations small or large? what does this indicate, what is the consequence?). Each group submits a joint report. The report should not exceed 8 pages.
5. The report is to be handed in by Nov. 6, 9:00 (email to AW).

Next class

On Oct 30 each group will (i) present its final software (show functions and explain how they are used), (ii) demonstrate live how the software processes the two data sets mentioned above, and (iii) discuss/interpret the numerical results, (iv) comment on their learning experience during this first part of the course.