Database for shared and automated photogrammetry survey analysis

R. Murayama,[*1] M. Kurata-Nishimura,[*2] and H. Otsu[*2]

Photogrammetry surveys using V-STARS (Geodetic Systems Inc.) have been utilized to measure the precise alignment of detectors in SAMURAI.[1)] The survey analysis is conducted manually using newly captured pictures each time, which is a time-consuming process that requires technical expertise. We prepare design files, which are (x,y,z) database files of TARGET markers on detectors, for the SAMURAI experiments to minimize the effort and simplify the procedures. When more than three markers are renamed manually, the design file is imported into the photogrammetry system, and the rest of the markers can be identified and renamed automatically from the relative positions.

Before organizing the design files, we established the recommendation of the naming rule to share survey data in future. The recommendation follows naming conventions. We introduce the details of the lists of the design files and naming rules.

Table 1 shows the marker names on the standard equipment to be organized. In Table 1, "standard equipment" refers to a piece of equipment used in many experimental setups. Other pieces called "specific equipment" refer to user-specific equipment introduced for each individual experiment.

To avoid conflicts in marker names, the following naming rules are recommended.

- Marker names of **standard equipment** are formatted as **ZXX[T,U,R,L,D,B]_[11-99]**, where Z is the prefix and XX represents the detector name and number. A four-character code (**XXXX**) is used for **specific equipment** instead of XX used for the standard equipment.
- In the selection of [T,U,R,L,D,B], T stands for top, U for upstream, R for right, L for left, D for downstream, and B for the bottom surface of the equipment.
- The numbers at the end of the name (point IDs) sequentially increase clockwise from the 12 o'clock position on a plane.
- Both adding and omitting the underscore are accepted.

According to the rules, the right 4th marker point on the FDC2 is denoted as ZF2R14 (or ZF2R_14). The prefix Z is added to facilitate easier identification in the list in the software. The reason for adding or omitting an underscore is related to historical background and software specifications. Underscores are inserted before the point IDs when marker-importing scripts are run, following the specifications.

Table 1. Reserved marker names for standard equipment based on naming rules. An "alignment marker" includes a precisely sized hole for a laser tracker and a photogrammetry target (*). "TPC" has a special naming rule because of historical reasons (**).

Standard equipment	Reserved marker name
Alignment marker (*)	ZSA[0,5-16]
SAMURAI Magnet	ZMG[T,U,R,L,D,B]_#
CATANA	ZCA[T,U,R,L,D,B]_#
FDC1	ZF1[T,U,R,L,D,B]_#
FDC2	ZF2[T,U,R,L,D,B]_#
HODOF	ZHF[T,U,R,L,D,B]_#
PDC1/2	ZP[1,2,U][T,U,R,L,D,B]_#
HODOP	ZHP[T,U,R,L,D,B]_#
(NEBULA	ZNB[T,U,R,L,D,B]_#)
TPC (**)	Z_R[D,F,L,R][S,T,R]#

Fig. 1. Photograph of the FDC2. Markers in bad positions are circled. Left one is located behind cables. Two on the right are too close to distinguish. The markers attached to the scribed lines are still recommended.

In this fiscal year, we organized the marker positions for FDC2 and PDC1/2. FDC2 and PDC1/2 place high priority on the accuracy requirements. Equipment with low priority, such as NEBULA, were switched off. In most cases, direct measurements using a measuring scale or laser distance meter are sufficient for such equipment.

We created design files that include 48 and 30 markers for FDC2 and PDC1/2, respectively. The accuracy of the markers was within 0.3 mm according to the error values provided by V-STARS. We found that the accuracy of some markers decreased because of their placement in the blind spots. In addition, we found that certain markers caused positioning errors when

*1 ResearchDX FoundationTeam, TRIP Headquarters, RIKEN
*2 RIKEN Nishina Center

DOI:10.34448/RIKEN.APR.58-153

two markers were too close to distinguish. Both cases are shown in Fig. 1. The accuracy of overly close markers was 4 mm; however, it was improved to match that of the other markers after manual correction. We decided to mask misleading markers to prevent them from being photographed in future surveys. Moving forward, we aim to refine the accuracy and enhance the application range of the current procedures based on feedback from future surveys conducted for real experiments.

Reference

1) R. Murayama, M. Kurata-Nishimura, H. Otsu, in this report.