Update on Including Survey Data

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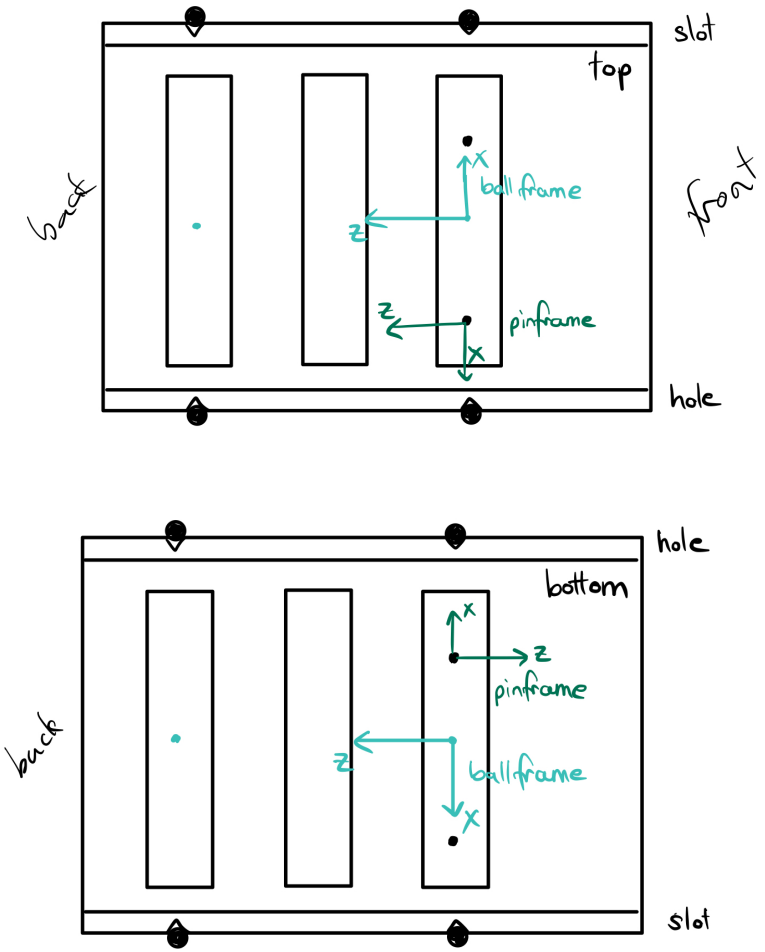
SLAC NATIONAL ACCELERATOR LABORATORY

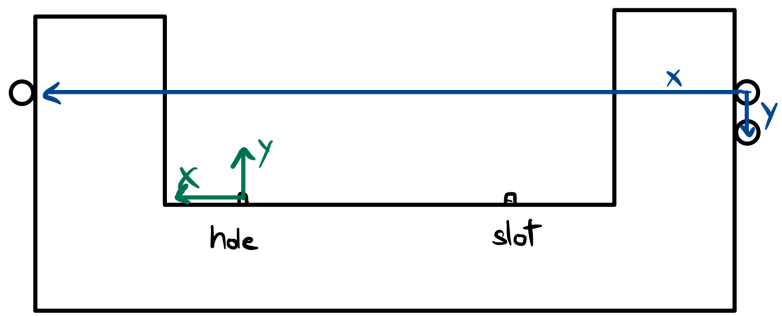
Relevant coordinate systems

- Uchannel coordinate systems – ball I and pin



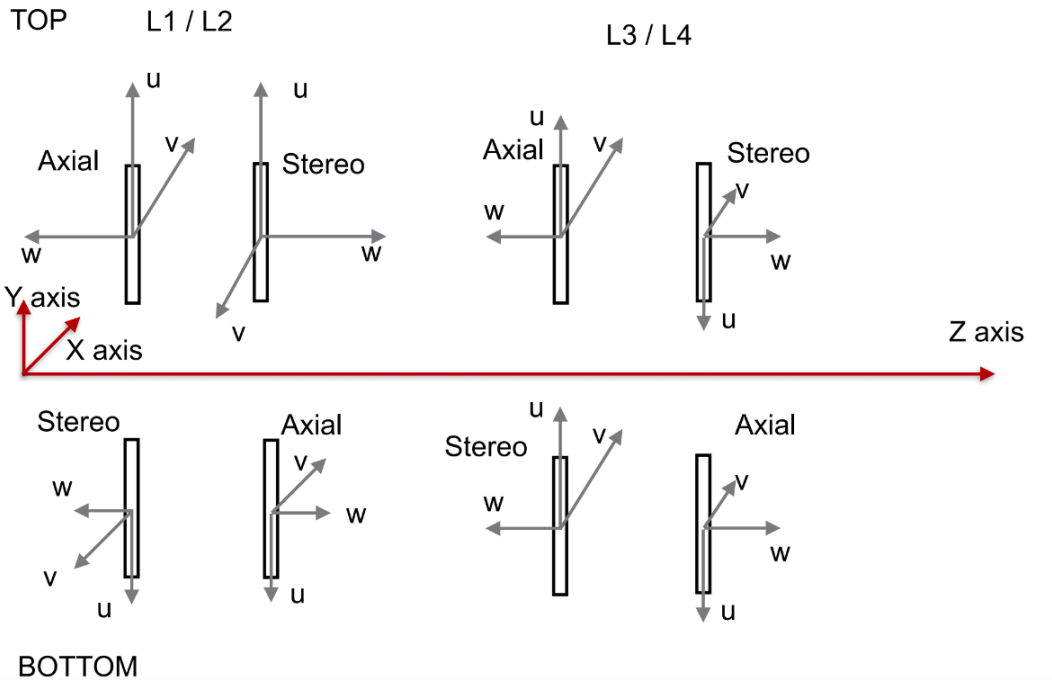
Relevant coordinate systems

- Uchannel coordinate systems – ball I and pin
- Fixture coordinate systems – ball II and pin



Relevant coordinate systems

- Uchannel coordinate systems – ball I and pin
- Fixture coordinate systems – ball II and pin
- Sensor coordinate system
  - Origin at sensor center
  - w-axis parallel to sensor normal



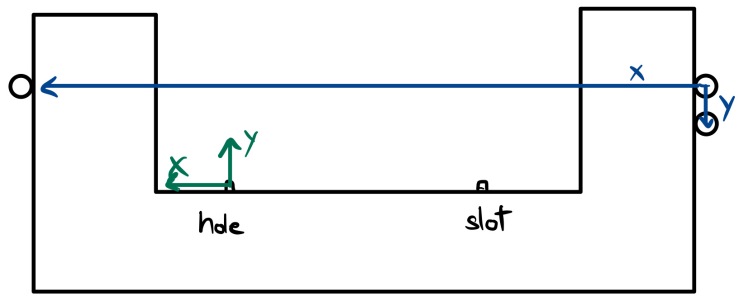
Fixture ball frame positions

sensor	diag	diff	axi	diff
L1tA	35.7820	-0.0013	314.9445	-0.0743
L1tS	35.8202	0.0370	314.9410	-0.0777
L2tA	35.7753	-0.0080	314.9871	-0.0316
L2tS	35.7817	-0.0016	314.9815	-0.0373
L1bA	35.7704	-0.0128	314.9115	-0.1072
L1bS	35.7815	-0.0018	314.9454	-0.0733
L2bA	35.7830	-0.0002	314.8982	-0.1206
L2bS	35.8650	0.0817	314.9999	-0.0188
empty	35.7833		315.0188	

Distances to diag and axi ball from origin in fixture ball frame

Fixture ball frame angles

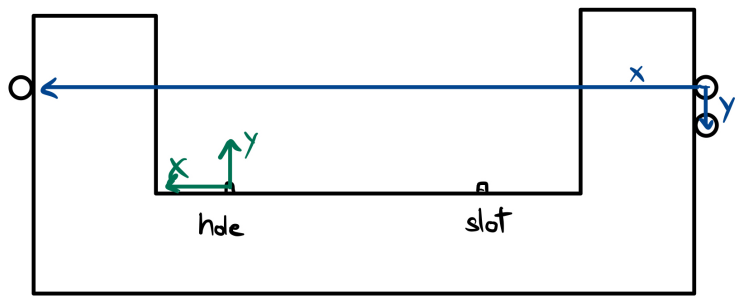
sensor	angle/deg	diff
L1tA	89.9687	0.0854
L1tS	89.9713	0.0880
L2tA	89.9329	0.0496
L2tS	89.9976	0.1143
L1bA	89.9376	0.0543
L1bS	89.9667	0.0834
L2bA	89.9591	0.0759
L2bS	89.8707	-0.0126
empty	89.88	



Sensor origin in fixture ball frame

sensor	x	y	z
L1tA	129.4719	13.1947	10.7133
L1tS	128.6457	7.5413	5.0280
L2tA	129.5765	13.2146	10.6496
L2tS	128.6926	7.5025	5.1053
L1bA	129.5577	13.2877	10.6964
L1bS	128.7147	7.5060	5.0832
L2bA	129.5747	13.3472	10.6152
L2bS	128.7409	7.6117	4.9682

Position of sensor origin in fixture ball frame



Generating survey constants

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Generating survey constants

Here is an example of how to run the program to get the 2019 survey constants from the measurement data. Run this from the top level of hps-align.

```
python -m hps_align survey data 2019 survey_data/2019_file_list.json
```

For more information, run

```
python -m hps_align survey data --help
```

- 2019_file_list.json includes paths to OGP data output files
- Separate files for empty fixture, sensors, uchannel, ...
- Additional documentation can be found on the hps-align github and here

Survey results

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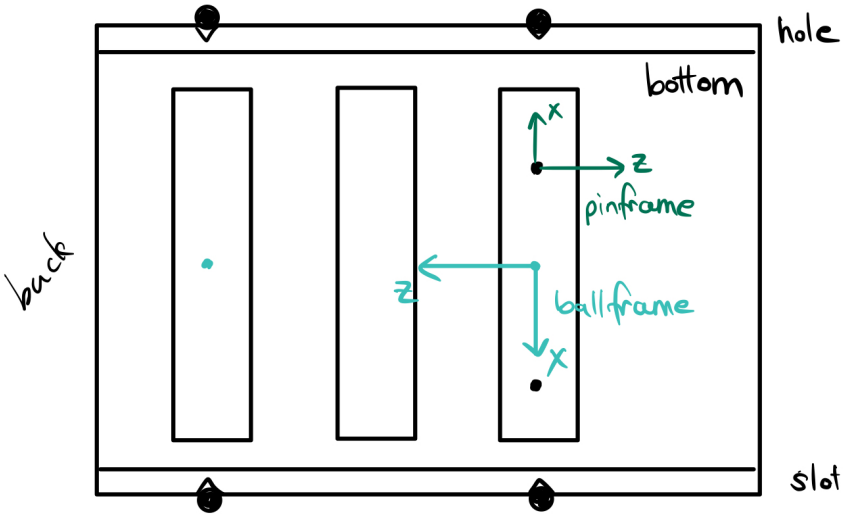
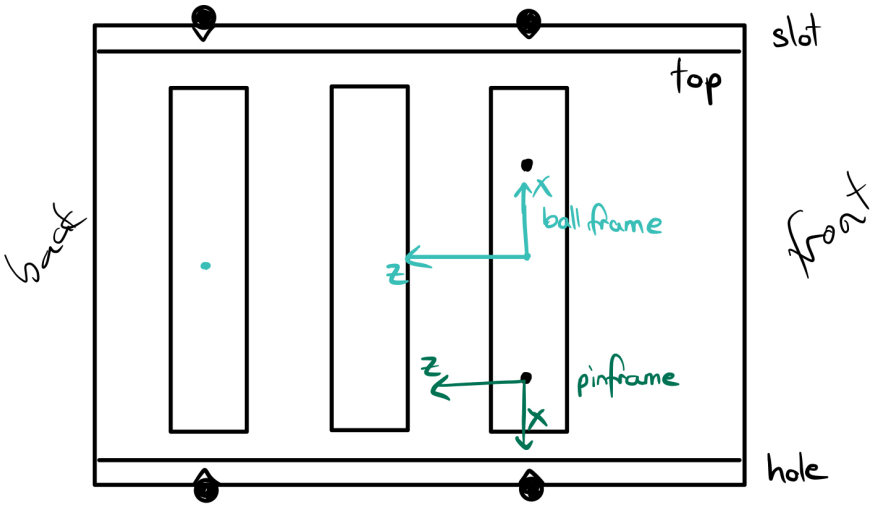
```
<SurveyVolume name="module_L1t" desc="top L1 pin basis in U−channel fiducial frame:">
<origin x="−25.88158514973287" y="42.99892517760935" z="−50.03301801659981" />
<unitvec name="X" x="−0.9999996964781495" y="−0.0006954241430035897" z="−0.0003513244515531291" />
<unitvec name="Y" x="0.0006959187979433173" y="−0.999998764055625" z="−0.0014098170979412582" />
<unitvec name="Z" x="−0.0003503435964885218 5" y="−0.0014100611633209774" z="0.9999989444928828" />
</SurveyVolume>

<SurveyVolume name="module_L1t_halfmodule_axial" desc="top L1 axial sensor basis in pin frame:">
<origin x="−54.403437415613325" y=" 43.64423756591145" z="−3.879656297299543" />
<unitvec name="X" x="0.006117772861112804" y="0.999980109127196" z="−0.0015343419375560404" />
<unitvec name="Y" x="−0.999975430314978" y="0.0061229808930100054" z="0.0034128977949018217" />
<unitvec name="Z" x="−0.0034222246557528892" y="−0.0015134249057505164" z="−0.9999929989372227" />
</SurveyVolume>

<SurveyVolume name="module_L1t_halfmodule_stereo" desc="top L1 stereo sensor basis in pin frame:">
<origin x="−55.19978625183185" y=" 43.641901947926925" z="4.141013913207999" />
<unitvec name="X" x="−0.09285949547112012" y="−0.9956787485006877" z="−0.000971537417402117" />
<unitvec name="Y" x="−0.9956712992586184" y="0.09285481967265265" z="0.004079987281115084" />
<unitvec name="Z" x="0.0039721446982612825" y="−0.00134619748311 6062" z="0.9999912048707391" />
</SurveyVolume>
```

- Example of survey results for L1t axial and stereo sensors

UChannel coordinate systems



bottom



top

Sensor measurement