ERROR MODEL MAINTENCE GROUP UPDATE

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Wellbore Positioning Technical Section

The Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA)

Error Model Documentation

On going

Document – based on ebook write up

Have a spreadsheet demonstrating implementation – needs some checking

Flowchart of the process

The error model definitions – in spreadsheet

Mathematical derivation – lumped misalignments and scalefactors, singular cases for accelerometer biases

Validation Datasets for Software

Should create further validation data sets for

- Inclination only
- MWD-MWD tie-ons with latest Rev4 models
- Gyro-MWD tie-on

Some problems about reproducing gyro paper results when gyro is re-initialised. Needs clarification

Inclination Only Surveys

- Recommendations for handling inc only surveys has been added to the website
- Will update this document for a further release with details of handling tie-ons with directional surveys

Correlation of Error Sources

- Standard anti-collision method is combining covariances
- Current combined methods simply add uncertainty and implicitly assume all errors are uncorrelated.
- Noted that this was not strictly correct for geo-magnetic reference terms
- Error model able to accommodate 1 or 0 values via global propagation. Rarely implemented

Correlation of Error Sources

- Current practice generally the conservative option – perhaps optimistic for interleaved wells
- Previously agreed to
  - Evaluate correlation values
  - Evaluate effect – is this important?
  - Determine how they could be handled

Correlation of Error Sources

- Stefan Maus estimated correlations between declination error if two surveys depending on geomagnetic model in use

Estimate of average actual correlation (Stefan's analysis)								
	IGRF	Standard	HD #1	HD #2	IFR1 #1	IFR1 #2	IFR2 #1	IFR2 #2
IGRF	0.55	0.66	0.34	0.34	0.03	0.03	0.03	0.03
Standard		0.79	0.40	0.40	0.03	0.03	0.03	0.03
HD #1			0.68	0.49	0.04	0.04	0.04	0.04
HD #2				0.68	0.04	0.04	0.04	0.04
IFR1 #1					0.39	0.08	0.39	0.08
IFR1 #2						0.39	0.08	0.39
IFR2 #1							0.44	0.09
IFR2 #2								0.44

Correlation of Error Sources

- Evaluated the effect on some scenarios
  - parallel, opposing and converging wells
  - for MWD, MWD+IFR single and multiple legs
- Run analysis on extreme cases
  - fully correlated and non-correlated
- Significant effect on ellipses, depending on relative importance of declination in the ellipse
- Most common cases conservative – only combined covariance in opposing wells optimistic

Course Length

- Jerry Codling presented details of further work on effect of survey interval on well position
- Candidate method of handling this
- Based on survey interval and angle changes across that interval
- Needs evaluated in an error model
- Discussed rules when Blind Drilling more appropriate
- Wanted to ensure stable and that users not penalised for shorter course lengths

Relationship with OWSG

- Trying to define boundaries with OWSG on models
- Error Model Maintenance group
  - Define mathematical framework
  - Producing supporting material for the framework
  - Including weighting functions
  - Handle the generic MWD model and derivatives
  - Uncertainties of geo-magnetic references

Relationship with OWSG

OWSG have created a reference set of models

Can create further models (as can any user)

Have various categories A/B/C/E/O

Offered as candidate – not mandated

Where new models are being produced will consult EMM prior to publication. New maths in advance.

Will not publish experimental or contractor models on website