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USER NOTES FOR PROGRAM SINEPICK100

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1. INTRODUCTION

Sinepick performs automated picking of downhole acoustic televiewer (ATV) or optical televiewer (OTV) scans. It could be adapted for other borehole scans (e.g. resistivity) or for images of oriented drill core. Sinepick can be applied to acoustic televiewer (ATV) travel time scans as well as amplitude scans.

The Sinepick algorithm can pick either planar features (which map as sinusoids) or vertical breakout features. Either dark (e.g. fracture) events or light (e.g. vein) events can be interpreted.

Sinepick chooses “picks of interest” from a large number of “mathematical picks”. Therefore Sinepick assigns priority or rank to each pick. Ranking at present is controlled by three attributes, the most important of which is amplitude or *strength*: events with amplitude less than a minimum (defined by the user) are rejected. Ranking and selection of picks is somewhat subjective and application-dependent.

There is some provision for “classification” of picked sinusoids (into high, medium, or low categories) according to their amplitude and other attributes, e.g. continuity; similarly, breakout features can be classified according to their length.

Input and output files are in WellCAD-compatible ASCII (wai, wax, wag; war, waj) formats.

This version of the program is configured for a maximum of 2^{21} (~2,000,000) depth records, corresponding to 2km of continuous televiewer data at 1mm depth pixel size. Sinepick could be adjusted to handle larger data sets if required.

The maximum sinusoid thickness to be picked is specified in mm (not metres). The user can define maximum thickness as either apparent thickness or true thickness.

Picking “accuracy” is an elusive concept in the context of borehole televiewers, since different expert interpreters will not entirely agree amongst themselves, nor pick absolutely consistently from one day to the next. For this reason and for technical reasons, Sinepick will not achieve 100% accuracy; 80-90% accuracy is more typical. At present Sinepick performance is adequate to quickly characterise the principal structure sets. However, the Sinepick interpretation should be checked and edited by a human expert prior to structural analysis in situations where “every defect counts”.

Depth intervals where data quality is poor, e.g. due to drillers’ grease, can be specified in a “blanking file”. These intervals are ignored during sinusoid or breakout picking.

2. SINEPICK OPTIONS

Sinepick provides five options:

1. De-striping

“De-striping” (suppression of centralisation stripes) is often desirable prior to picking of sinusoids from amplitude images. [De-striping could be detrimental prior to breakout picking].

2. Sinusoid picking

Sinusoids (planar) features are interpreted from ATV or OTV scans. Sinepick can interpret the thickness of features, as well as their orientation.

3. Breakout picking

Breakout features, due to incipient wall failure, are currently assumed to be parallel to the borehole axis, 180° apart, and ten degrees wide.

4. Sharpening

“Sharpening” enhances continuity and contrast of narrow features. It is often desirable prior to picking of sinusoids or breakout features from amplitude images.

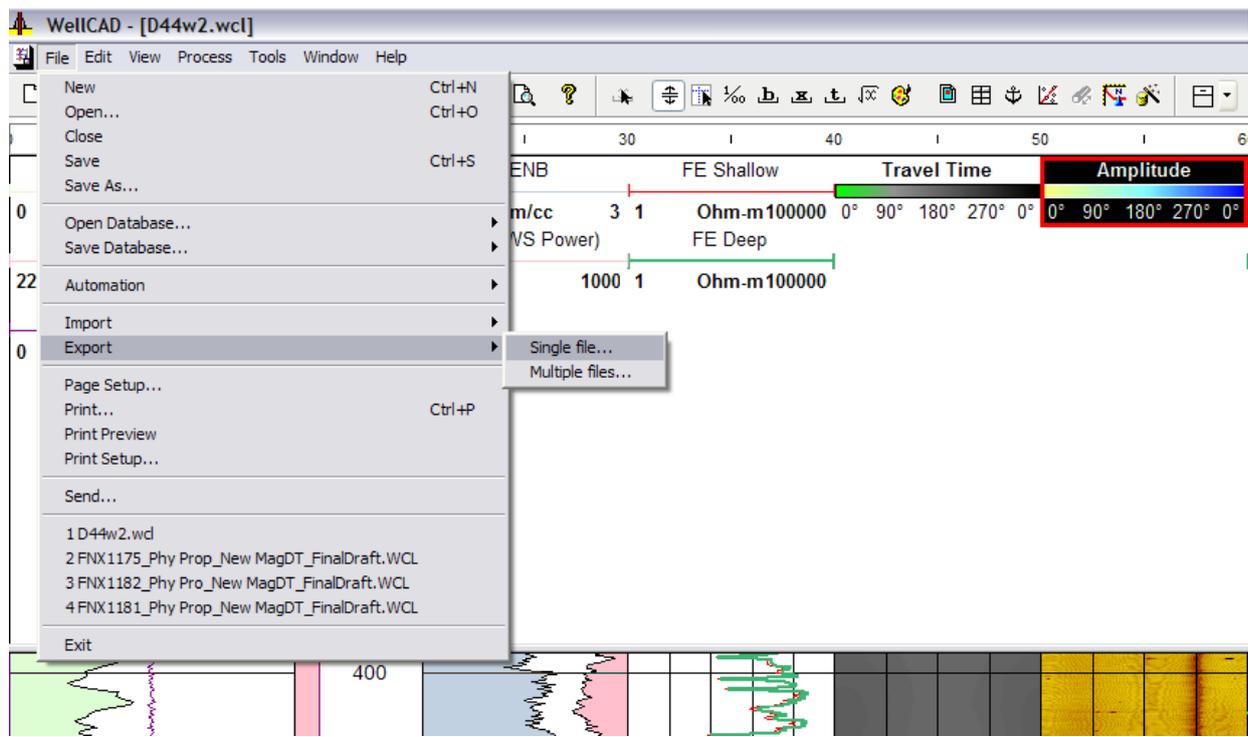
5. De-striping + sharpening

This option performs de-striping and sharpening simultaneously. “De-striping + sharpening” is often desirable prior to picking of sinusoids from amplitude images. [De-striping could be detrimental prior to breakout picking].

3. RUNNING SINEPICK

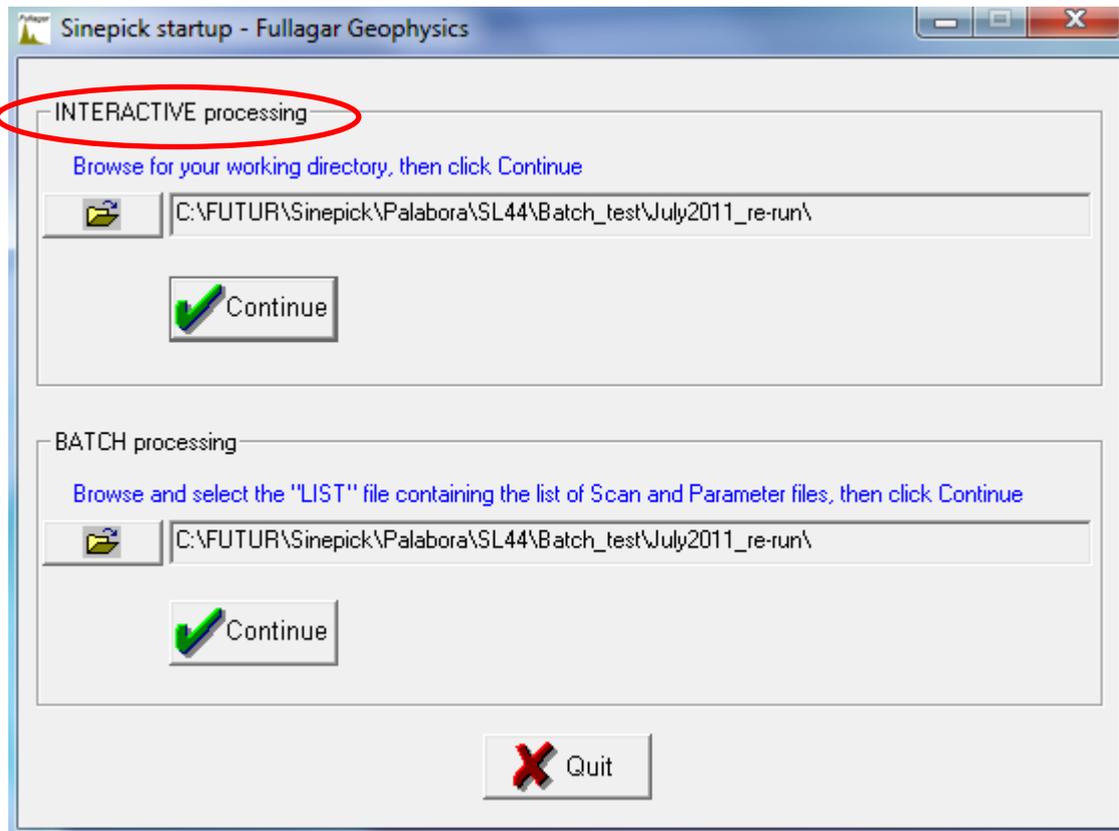
3.1 Creating the televiewer scan file

Sinepick reads data in WellCAD *wai*, *wax*, or *wag* (ASCII comma-delimited) formats. Create the ASCII scan file using the WellCAD *Export/Single file* option. Save ATV as a WAI or WAX file, and OTV as a WAG file.



3.2 Launching Sinepick to process a single scan

Use the Sinepick interface (illustrated), and define the working directory for INTERACTIVE processing. The working directory is the location of the televiewer data and of the Sinepick parameter file (if it already exists). Once the working directory has been defined, click “Continue” and follow the prompts.



Alternatively, open a DOS command window in the directory where the televiewer scan is stored. It may be necessary to open the command window “As Administrator”. To launch Sinepick, enter SINEPICK100 at the DOS prompt.

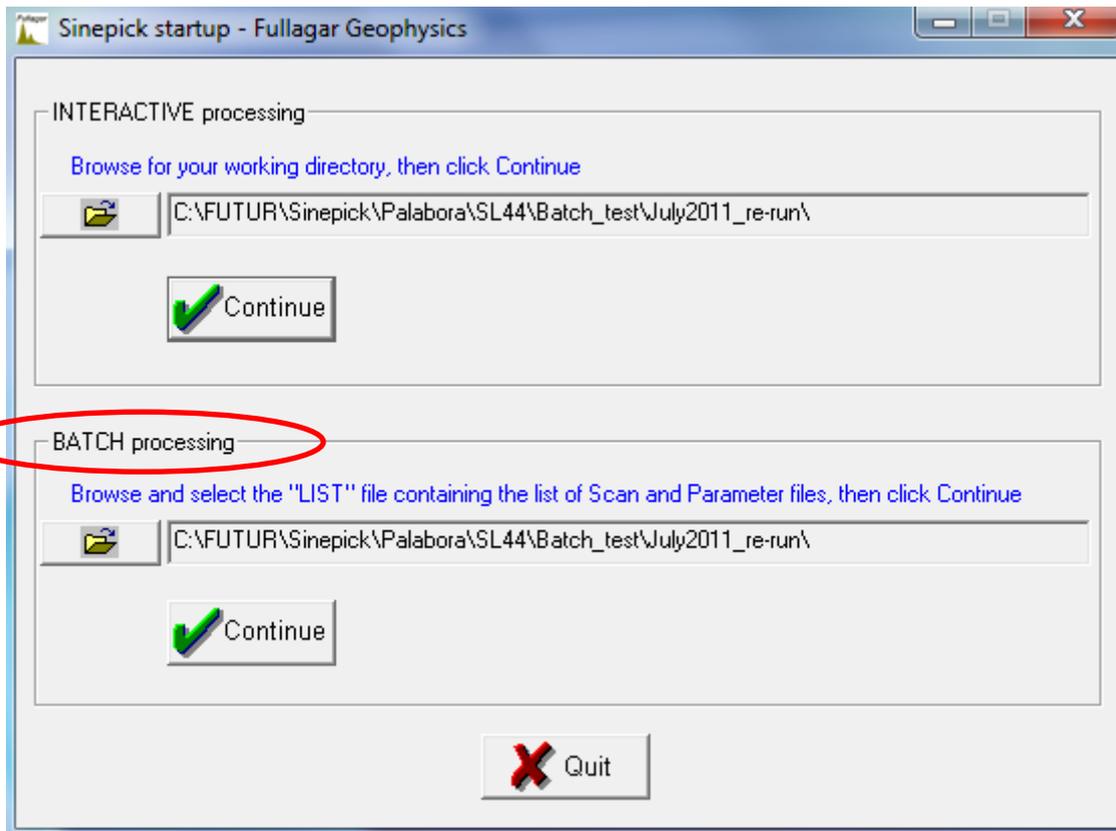
3.3 Launching Sinepick to process multiple scans “in batch”

For batch runs the televiewer scans are usually stored in sub-directories below the project directory, one sub-directory for each drill hole. Use the Sinepick interface to select the “list” (LST) file for BATCH processing.

Alternatively, launch a Sinepick batch run from a DOS command window opened in the project directory. It may be necessary to open the command window “As Administrator”. The syntax for a Sinepick batch run is:

```
SINEPICK100 filename.LST
```

where “filename.LST” is a file containing a list of scan files to be processed, and the corresponding parameter files.



The format for each record in the LST file is

scan_path\scan_file param_path\param_file

where *scan_file* is a WellCAD ASCII file (in WAI, WAX, or WAG format), and where *param_file* is a Sinepick parameter file. If no *scan_path* is specified, then the scan file is assumed to reside in the project directory; likewise, if no *param_path* is specified, the parameter file is assumed to reside in the project directory.

The path can be defined relative to the project directory. For example, if there is a borehole with number 4567 in a sub-directory 4567 below the project directory, then the entry in the LST file could be

4567\4567.wai global.inp

where *global.inp* is a parameter file in the project directory.

An **example** of an LST file for a Sinepick batch run is included below:

```
OTD1630\OTD1630_ABI_0_48_u.wai FILT.inp
OTD1630\OTD1630_ABI_0_48_u+FILT.wax SINUSOID.inp
OTD1630\OTD1630_ABI_147_408_u.wai FILT.inp
OTD1630\OTD1630_ABI_147_408_u+FILT.wax SINUSOID.inp
```

In this case, two scan files are filtered (de-striped) and then submitted for sinusoid picking.

The *FILT.inp* file contains parameters for de-stripping. For example:

```
0.0 3000.0      !min depth, max depth (m)
1              !flag for de-stripping
100.0         !borehole diameter (mm)
DUMMY        !scan file name (ignored for batch runs – read from LST file)
0            !IWAG=1 for RGB scan; IWAG=0 otherwise
X           !RGB channel (arbitrary character otherwise)
```

The depth range [0 – 3000m] is large, to capture all the available data in each scan file presented to Sinepick. The scan file name is recorded as “DUMMY” because the scan file is read from the *LST* file in batch mode.

The filtered (de-stripped) version of the first scan file is *OTD1630_ABI_0_48_u+FILT.wax*. Sinusoids are then picked from this filtered scan file.

The *SINUSOID.inp* file contains parameters for sinusoid picking. For example:

```
0.0 3000.0      !min depth, max depth (m)
2              !flag for sinusoid picking
100.0         !borehole diameter (mm)
-1           !flag for negative (dark) features
10%          !minimum acceptable pick ampl as % of scan maximum
10.0         !pick density, in picks/m
5.0          !min core angle (deg)
90.0         !max core angle (deg)
2.0          !core angle increment, CAINC (deg)
0            !NCLASS for classification (amplitude only if NCLASS=0)
100         !max thickness to be picked (mm)
DUMMY        !scan file name (name read from LST file in batch mode)
0            !IWAG=1 if RGB data (.WAG); =0 otherwise
X           !arbitrary character (except for RGB data)
Blanking_file.WAL !depth blanking file name
```

The depth range [0 – 3000m] is large, to capture all the available data in each scan file presented to Sinepick. The scan file name is recorded as “DUMMY” because the scan file is read from the *LST* file in batch mode.

The sinusoids picked from *OTD1630_ABI_0_48_u+FILT.wax* are recorded in *OTD1630_ABI_0_48_u+FILT+SINUSOID.war*.

The same processing sequence is applied to the second scan file in the *LST* file, viz. *OTD1630_ABI_147_408_u.wai*. The filtered (de-stripped) version of the second scan is *OTD1630_ABI_147_408_u+FILT.wax*. The sinusoids picked from this filtered scan file are recorded in *OTD1630_ABI_147_408_u+FILT+SINUSOID.war*.

In adopting the same parameter files for both scans, the assumption is that the borehole diameter is identical for both. If the diameter changes, a different parameter file would be required for each scan.

The format for the blanking file is as follows:

top depth, bottom depth

m,m

221.2, 227.66

289.1, 292.7

375.42, 390.5

403.7, 411.98

3.4 Sinepick input

Input parameters are either read from an existing Sinepick parameter file, or else entered interactively. The interactive input is saved to a parameter file. The interactive input for each of the three Sinepick options is described in turn below.

3.4.1 De-stripping

The user is prompted for a Sinepick parameter file name:

- *Enter parameter file name*
(If this file does not exist, it will be created)

If the parameter file already exists, Sinepick will read it and execute; if not, the user is prompted for the following input:

- *Enter minimum,maximum depths (m) for Sinepick interp:*
- *Enter 1 for de-stripping*
Enter 2 for sinusoid picking
Enter 3 for breakout picking
Enter 4 for sharpening
Enter 5 for de-stripping + sharpening: 1
- *Enter borehole diameter (mm):*
- *Define the scanfile name (WellCAD .wai or .wax):*

3.4.2 Sinusoid picking

The user is prompted for a Sinepick parameter file name:

- *Enter parameter file name*
(If this file does not exist, it will be created)

If the parameter file already exists, Sinepick will read it and execute; if not, the user is prompted for the following input:

- *Enter minimum, maximum depths (m) for Sinepick interp:*
- *Enter 1 for de-stripping*
Enter 2 for sinusoid picking
Enter 3 for breakout picking
Enter 4 for sharpening
Enter 5 for de-stripping + sharpening: 2
- *Enter borehole diameter (mm):*
- *Enter -1 for low amplitude events*
Enter 1 for high amplitude events:
Sinepick picks either “low amplitude” or “high amplitude” events. Usually fractures have low amplitude and appear dark, while quartz veins (for example) have high amplitude and appear light; however, this convention is not necessarily adopted by all contractors.
- *Define minimum acceptable pick amplitude, AMPMIN*
Specify AMPMIN as percentage of scan maximum; include “%” symbol
5% is a typical value. As AMPMIN increases, fewer events will achieve the threshold.
- *Define maximum acceptable event frequency, F_DEN*
F_DEN is expressed as number per m
10 is a typical value. As F_DEN increases, more events will be picked.
- *Define minimum core angle (deg), CA_MIN*
5 is a typical value. Note that a planar feature with 5° core angle spans a depth range (i.e. sinusoid peak-to-trough distance) of 1.14m in a 100mm diameter hole.

If the picking is restricted to features which are virtually orthogonal to the borehole axis, Sinepick saves the residual scan, i.e. after subtraction of the interpreted “near-horizontal” picks. This can be an effective way to suppress drilling-induced noise, i.e. scoring of the borehole wall. The residual scan is saved (with label +deGroov) if CA_MIN ≥ 87.5°. The residual scan can then be used as input for subsequent Sinepick processing. Of course care must be exercised, since this process can remove valid geological features oriented orthogonal to the borehole in addition to the unwanted drilling artefacts.

- *Define maximum core angle (deg)*
Any value up to 90 is OK.
- *Define core angle increment (deg)*
2 is a typical value.
- *Enter NCLASS, the number of attributes for which cutoffs are defined*

(Enter zero if only default amplitude cutoffs are required)

At least six attributes are always calculated, irrespective of the value of NCLASS

If NCLASS > 0, cutoffs are required for classification of picks as “strong”, “intermediate”, or “weak” according to values of selected attributes. If NCLASS = 0, amplitude (or strength) is the only attribute used for classification. The amplitude cutoffs are percentiles, best explained by example. For an upper cutoff of 80 the 20% of picks with highest amplitude would be regarded as “strong” and assigned an index of 1. For an intermediate cutoff of 60, the 60% of picks with lowest amplitude would be regarded as “weak” and assigned an index of 4. The remaining “intermediate” picks would be assigned an index of 2. The default upper and lower amplitude cutoffs are 90% and 70%.

IF NCLASS > 0 ...

- *Enter attribute ID, upper cutoff, intermediate cutoff (NCLASS records required):*

The attribute IDs are as follows:

- 1 amplitude
- 2 standard deviation
- 3 continuity (%)
- 4 roughness
- 5 centre line average
- 6 upper margin average
- 7 lower margin average

The user can adjust the amplitude percentile cutoffs by including a record with attribute ID = 1, e.g. 1, 80, 50. Otherwise the default amplitude cutoffs will be adopted.

The continuity cutoffs are percentages of the circumference of the borehole. The cutoffs for all other attributes are absolute values, not percentages.

The cutoffs have no bearing on the picking; rather they control the “classification” of each pick into high, intermediate, or low categories according to its attribute value.

Roughness is not calculated unless a record with attribute ID = 4 is included; the other six attributes are always calculated, irrespective of the NCLASS value.

- *T_MAX is the maximum thickness to be picked (mm)*
ITRUE=1 for true thickness, =0 for apparent thickness

Enter T_MAX (mm), [ITRUE]:

T_MAX can be large, e.g. 500mm, but at the expense of processing time – especially if T_MAX is true thickness. If *maximum thickness* < 0, processing is completed using its absolute value but sinusoid apertures are all recorded as zero in the structure log. ITRUE is optional; if not specified it defaults to zero, and T_MAX is assumed to be apparent thickness.

- *Define the scanfile name (WellCAD .wai, .wax, or .wag):*

If a WAG file is nominated, the user will be prompted to select the red (R), green (G), blue (B), or amplitude (A) channel for processing, where the amplitude is defined as

$$A = \sqrt{R^2 + G^2 + B^2}$$

Three channel OTV filtering (but not sinusoid or breakout picking) is available on an experimental basis. For 3 channel processing, enter 3.

- *Define a blanking file (Y/N)?:*
- *Enter blanking file name:*

This optional file contains a set of depth intervals to be ignored during picking. The file is in WellCAD WAL format: two headers lines, followed by a list of **Top Depth**, **Bottom Depth** records defining the blanked intervals.

- *Define min/max core angles to be blanked (Y/N)?:*
- *Enter min/max core angles to be blanked, CABMIN & CABMAX:*

CABMIN and CABMAX are optional. If specified, only picks with core angles \geq CABMIN and \leq CABMAX will be rejected within the blanked depth intervals. If CABMIN and CABMAX are not specified, all picks will be rejected within the blanked intervals.

A sample parameter file for sinusoid picking is listed below:

```

146. 200.           !min depth(m), max depth(m)
2                 !flag for sinusoid picking
100.              !borehole diameter (mm)
-1                !flag for negative (dark) features
25.0              !AMPMIN = 25, approx. 5% of maximum
10.0              !FDEN = 10 picks/m
5.0               !min core angle (deg)
90.0              !max core angle (deg)
1.0               !core angle increment, CAINC (deg)
1                 !NCLASS
4, 85, 50         !attribute ID, upper cutoff, intermediate cutoff
100               !max thickness (mm) [interpreted as apparent thickness if ITRUE
                  missing]
FILT_147_408_u.wax !scan file (ignored for batch run)
0                 !IWAG=1 if RGB data (.WAG); =0 otherwise
X                 !arbitrary character (except for RGB data)

```

3.4.3 Breakout picking

The user is prompted for a Sinepick parameter file name:

- *Enter parameter file name*

(If this file does not exist, it will be created)

If the parameter file already exists, Sinepick will read it and execute; if not, the user is prompted for the following input:

- *Enter minimum,maximum depths (m) for Sinepick interp:*
- *Enter 1 for de-stripping*
Enter 2 for sinusoid picking
Enter 3 for breakout picking
Enter 4 for sharpening
Enter 5 for de-stripping + sharpening: 3
- *Enter borehole diameter (mm):*
- *Enter -1 for low amplitude events*
Enter 1 for high amplitude events:
Breakout is usually interpreted from acoustic “travel time” scans. Travel time is longer for breakout-affected walls, so “high amplitude” is the correct choice normally. However, this is not always the case, e.g. if breakout is interpreted from an ATV amplitude scan.
- *Define minimum acceptable pick amplitude, AMPMIN*
Specify AMPMIN as percentage of scan maximum; include “%” symbol
5% is a typical value. As AMPMIN increases, fewer events will achieve the threshold.
- *Define maximum acceptable event frequency, F_DEN*
F_DEN is expressed as number per m
5 is a typical value. As F_DEN increases, more events will be picked.
- *Define minimum breakout length (m):*
0.05 is a typical value. Must be larger than the depth dimension of the image pixels.
- *Define maximum breakout length (m):*
Can be several metres.
- *Define breakout length increment (m):*
Must be larger than the depth dimension of the image pixels. As the breakout length range increases, and the length increment decreases, the processing time increases.
- *Define the scanfile name (WellCAD .wai or .wax):*
- *Define a blanking file (Y/N)?:*
- *Enter blanking file name:*

This optional file contains a set of depth intervals to be ignored, in WellCAD WAL format: two headers lines, followed by a list of Top Depth, Bottom Depth records defining the blanked intervals.

3.4.4 Sharpening

The user is prompted for a Sinepick parameter file name:

- *Enter parameter file name
(If this file does not exist, it will be created)*

If the parameter file already exists, Sinepick will read it and execute; if not, the user is prompted for the following input:

- *Enter minimum,maximum depths (m) for Sinepick interp:*
- *Enter 1 for de-stripping
Enter 2 for sinusoid picking
Enter 3 for breakout picking
Enter 4 for sharpening
Enter 5 for de-stripping + sharpening: 4*
- *Enter borehole diameter (mm):*
- *Define the scanfile name (WellCAD .wai or .wax):*

3.4.5 De-stripping & sharpening

The user is prompted for a Sinepick parameter file name:

- *Enter parameter file name
(If this file does not exist, it will be created)*

If the parameter file already exists, Sinepick will read it and execute; if not, the user is prompted for the following input:

- *Enter minimum,maximum depths (m) for Sinepick interp:*
- *Enter 1 for de-stripping
Enter 2 for sinusoid picking
Enter 3 for breakout picking
Enter 4 for sharpening
Enter 5 for de-stripping + sharpening: 5*
- *Enter borehole diameter (mm):*
- *Define the scanfile name (WellCAD .wai or .wax):*

3.5 Output files

Sinepick generates output in WellCAD ASCII format files, to expedite display of results.

In addition, Sinepick creates a log file (*Sinepick17.out*) file. The log file records run details and, if a problem arises, error messages.

3.5.1 De-stripping output

After de-stripping, the filtered scan output is written to a file

scan_path\scan_file_root+param_file_root.wax

in WellCAD ASCII floating point format. Here, *scan_file_root* denotes the scan file name without extension; likewise, *param_file_root* denotes the parameter file name without extension.

The .WAX file will be recognised as an image log by WellCAD, and can be imported straight into a WCL file using the *Import into current document* option in the *File* menu.

3.5.2 Sinusoid picking output

Sinepick records all picks in a WellCAD structure log file, named

scan_path\scan_file_root+param_file_root.war

where *scan_file_root* denotes the scan file name without extension and where *param_file_root* denotes the parameter file name without extension.

The fields in the WAR file are as follows:

Depth, Azimuth, Dip, Aperture, Index, Amplitude, Sdeviation, Continuity, Roughness, AvMid, AvUpp, AvLow

where

Depth (m) is the depth of intersection of the planar structure with the borehole axis;

Azimuth (deg) is azimuth of the normal to the planar structure, referenced to the zero azimuth of the scan;

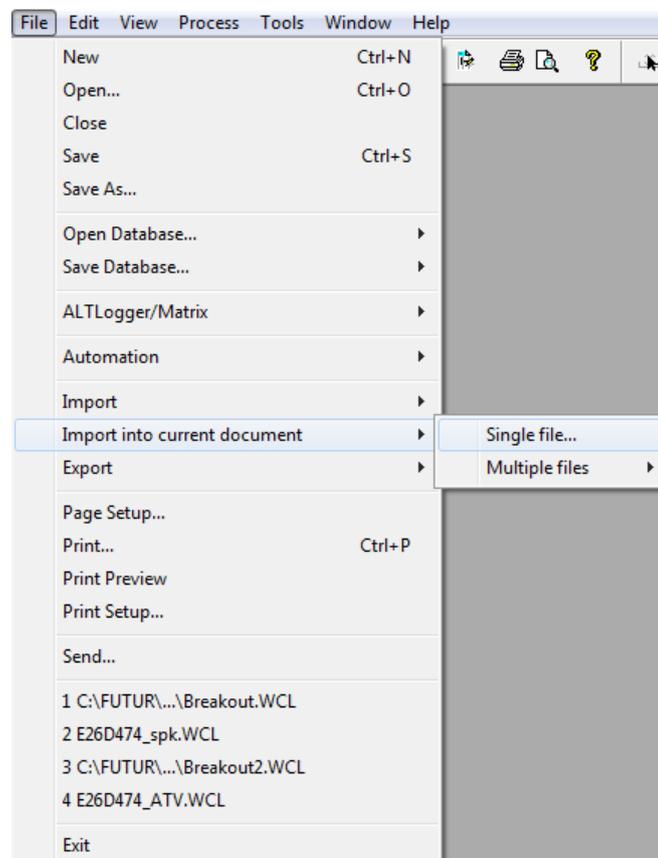
Dip (deg) is the apparent dip of the planar structure, with a structure orthogonal to the borehole axis assigned an apparent dip of zero;

Aperture (mm) is the true thickness of the planar structure;

Index is an integer flag, assuming value 1 for thick high amplitude picks, 2 for intermediate amplitude picks, and 4 for low amplitude picks. The demarcation between “high” and “intermediate” amplitude picks is the *upper cutoff* specified in the input; for the default upper cutoff of 90%, the top 10% of amplitudes are considered “high”. The demarcation between “intermediate” and “low” amplitude picks is the *lower cutoff*.

Amplitude, Sdeviation, and Continuity are attributes of the structure, used by Sinepick to rank events.

The .WAR file will be recognised as a structure log by WellCAD, and can be imported straight into a WCL file using the *Import into current document* option in the *File* menu. For older versions of WellCAD, read the picks into WellCAD using the *Import* utility, then *Paste* into the desired WCL file.



Define the structure log file as a *Projection* log under *Main Settings\Projection...*. Remember to set the hole diameter to the correct value. Do **not** re-compute the dips.

3.5.3 Breakout picking output

Sinepick records all breakout picks in a WellCAD structure log file named

scan_path\scan_file_root+param_file_root.waj

where *scan_file_root* denotes the scan file name without extension and where *param_file_root* denotes the parameter file name without extension.

The fields in the WAJ file are as follows:

Depth, Azimuth, Tilt, Length, Opening, Type, Amplitude

Depth (m) is the depth of the midpoint of the breakout feature;

Azimuth (deg) is azimuth of the breakout feature, referenced to the zero azimuth of the scan;

Tilt (deg) is the apparent tilt of the breakout feature with respect to the borehole axis (currently assumed to be zero by Sinepick);

Length (m) is the length of the breakout feature;

Opening (deg) is the angular width of the breakout feature (currently assumed to be 10° by Sinepick);

Type is an integer flag, assuming value 1 for strong events, 2 for intermediate events, and 4 for weak events.

Amplitude is the “strength” of the breakout feature, used by Sinepick to rank picks.

The .WAJ file will be recognised as a breakout file by WellCAD, and can be imported straight into a WCL file using the *Import into current document* option in the *File* menu. For older versions of WellCAD, read the picks into WellCAD using the *Import* utility, then *Paste* into the desired WCL file.

3.5.4 Sharpening output

After sharpening, the filtered scan output is written to a file

scan_path\scan_file_root+param_file_root.wax

in WellCAD ASCII floating point format. Here, *scan_file_root* denotes the scan file name without extension; likewise, *param_file_root* denotes the parameter file name without extension.

The .WAX file will be recognised as an image log by WellCAD, and can be imported straight into a WCL file using the *Import into current document* option in the *File* menu.

3.5.5 De-stripping & sharpening output

After de-stripping + sharpening, the filtered scan output is written to a file

`scan_path\scan_file_root+param_file_root.wax`

in WellCAD ASCII floating point format. Here, `scan_file_root` denotes the scan file name without extension; likewise, `param_file_root` denotes the parameter file name without extension.

The .WAX file will be recognised as an image log by WellCAD, and can be imported straight into a WCL file using the *Import into current document* option in the *File* menu.

4. CLASSIFICATION

Sinepick offers a basic capability for classification: one or more integer class flags are recorded in the Sinepick structure log (WAR or WAJ file). Sinusoid and breakout picks are always classified according to amplitude (strength):

`Index=1` for “strong” events, with amplitudes in the upper percentile range for the picked population. The default upper percentile cutoff is 90%.

`Index=2` for “intermediate” events, with amplitudes between the upper and lower percentile cutoffs.

`Index=4` for “weak” events, with amplitudes below the lower percentile cutoff for the picked population. The default lower percentile cutoff is 70%.

Sinusoidal picks can be classified according to additional attributes (by setting `NCLASS > 0` in the parameter file, and defining attributes IDs and cutoffs). The available attributes are standard deviation, continuity, roughness, and the central, upper, and lower averages.

For example, to include a continuity classification index in the output, insert a record of the form 3, `upper_cutoff`, `lower_cutoff` in the parameter file, immediately below the `NCLASS` record. Indices will then be defined in the WAR file as follows:

`Index=8` for highly continuous picks (percent continuity > high continuity cutoff);

`Index=9` for picks with continuity between the upper and lower cutoffs.

`Index=10` for weakly continuous picks, i.e. continuity < lower cutoff.

There is considerable scope to improve the classification of picks. For example, the selected picks could be sub-divided according to dip (sinusoids) or length (breakout). Combined interpretation of time and amplitude image interpretations would enable Sinepick to identify open fractures. Finally, other data could be brought to bear.

5. PRACTICAL CONSIDERATIONS

The advantages of auto-picking are speed and consistency. In addition, Sinepick will interpret complex (highly structured) zones without angst, as well as isolated structures.

Limitations are described below. These can be reduced in severity or eliminated via thoughtful selection of parameters, via further development of operational procedures, and via extension of the computer code.

1. Sinepick will try to fit whatever 'standard shapes' are made available to it. Currently it is restricted to sinusoids and breakout - so it will seek these features whether they are truly appropriate or not. The range of standard shapes can be expanded in the future as required.

2. Sinepick will pick across noisy or distorted data. Solution: exclude poor quality data intervals.

3. Sinepick will sometimes miss "hairline" structures which are clear to the eye. The underlying issues here are (i) dip resolution, (ii) the deviation of real structures from perfect sinusoidal shape, and (iii) selection of the visually preferred (e.g. continuous) structures from the many thousands of events picked by the computer. At the moment the selection is based on the structure's amplitude ("strength") and (for sinusoids) its continuity and contrast. Actions: (i) reduce the core angle increment, CAINC, and/or (ii) reduce the amplitude threshold, AMPMIN and/or increase the event density, FDEN. If Sinepick still fails to pick the event, the likely explanations are noise on the scan or distortion of the event (Sinepick looks for perfect sine curves).

6. TROUBLE SHOOTING

No output after running Sinepick

Relax event ranking parameters, e.g. reduce AMPMIN.

Check *Sinepick17.out* file for error messages.

Picked sinusoids do not appear to overlay structures when displayed in WellCAD

Ensure that borehole diameter is correct for the structure log: check under *Main settings\Projection...* Do **not** re-compute dips after entering the correct diameter.

Trouble with file names

Sinepick expects all scan files and parameter files to have an extension, i.e. to be of the form *file_name.xxx*.

Over-picking

To reduce the number of events picked by Sinepick, increase the minimum amplitude (AMPMIN) and/or decrease the fracture density (FDEN).

7. USER SUPPORT

For user support, contact:

Philip Muir in Hobart

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