

Project standard

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1 Displacement by image processing: IPDISP

Image processing is a wonderful technique to employ for the measurement of displacements and deformation of very soft materials, like clay. This document describes the contents of the header of a GEF file to store the results of such measurements.

1.1 Compulsory keywords

```
#GEFID= 1, 0, 0
#COLUMN= 2N+1
#COLUMNINFO= 1, s, Time, 101
#COLUMNINFO= 2, mm, Horz:1, 33000 +1
#COLUMNINFO= 3, mm, Horz:2, 33000 +2
  • • • •
#COLUMNINFO= 1 + N, mm, Horz:N, 33000 + N
#COLUMNINFO= 1 + N + 1, mm, Vert:1, 34000 + 1
#COLUMNINFO= 1 + N + 2, mm, Vert:2, 34000 + 2
  • • • •
#COLUMNINFO= 1 + N + N, mm, Vert:N, 34000 + N
#PROJECTID= identification of the project
#FILEOWNER= Creator of the file
#FILEDATE= yyyy, mm, dd
#EOH=
```

Notes:

- The number of columns is free to choose, depending on the number of markers, N, in your set-up, which are to be followed..
- Since the maximum number of columns is 250, the maximum number of markers to follow is 124.
- The number of markers can be derived from the value of Column: $N = (\text{Column} - 1)/2$.
- The number of markers is also recorded in Measurementtext 1.
- There must be exactly $2N+1$ lines with Columninfo
- The X locations of the markers are stored in columns 2 till :N+1
- The Y locations of the markers are stored in columns N+2 till $2N+1$.
- The user is free to pick a unit for the time: seconds, minutes, hours, days or weeks.

If the formula with $1 + N$ etc, are not immediately clear, check out the example in chapter 3.

1.2 Compulsory keywords for this standard

```
#COMPANYID= Company responsible for this file, VAT number, Country dial code
#MEASUREMENTCODE= GEF-IPDISP-Measurement, 1, 0, 0, ipdisp100.pdf
#MEASUREMENTVAR= 1, value, -, Number of markers
#MEASUREMENTVAR= 2, value, pixel, Initial X position
#MEASUREMENTVAR= 3, value, pixel, Initial X position
  • • • •
#MEASUREMENTVAR= 1 + N, value, pixel, Initial X position
#MEASUREMENTVAR= 1 + N + 1, value, pixel, Initial Y position
#MEASUREMENTVAR= 1 + N + 2, value, pixel, Initial Y position
  • • • •
#MEASUREMENTVAR= 1 + N + N, value, pixel, Initial Y position
#STARTDATE= yyyy, mm, dd
#STARTTIME= hh, mi, sec.ssss
#TIMECOLUMN= 1, Timecode, unit
```

#TESTID= *Identification of the experiment recorded in this file*

Notes:

- The original X and Y locations in the image are stored as pixels. Pixels as a unit makes it easier to point visually to the exact locations within an image.
- Measurementvar k has the initial location of the marker of which the displacement is recorded in column k.
- There must be at least $2N+1$ lines with Measurementvar. They will describe the original position of the marker in pixels.

1.3 Optional keywords

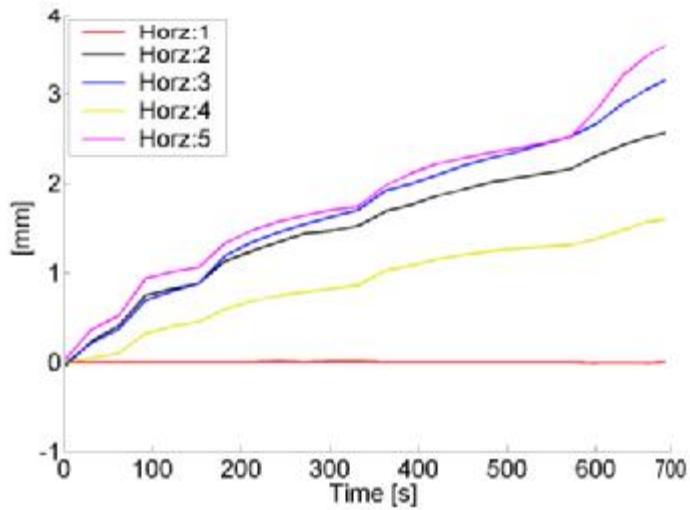
Every other GEF keyword may occur in the file, however they don't have a agreed meaning between sender and receiver of the file, which is specically the case for numbered variables, like Measurementtext and Measurementvar.

2 Example

In this example there are 5 markers. The number of columns is therefore $2 \times 5 + 1 = 11$.

```
#GEFID= 1, 0, 0
#FILEOWNER= adel
#FILEDATE= 2005, 7, 25
#PROJECTID= CO, 528750, 2
#COLUMN= 11
#COLUMNINFO= 1, s, Time, 101
#COLUMNINFO= 2, mm, Horz:1, 33001
#COLUMNINFO= 3, mm, Horz:2, 33002
#COLUMNINFO= 4, mm, Horz:3, 33003
#COLUMNINFO= 5, mm, Horz:4, 33004
#COLUMNINFO= 6, mm, Horz:5, 33005
#COLUMNINFO= 7, mm, Vert:1, 34001
#COLUMNINFO= 8, mm, Vert:2, 34002
#COLUMNINFO= 9, mm, Vert:3, 34003
#COLUMNINFO= 10, mm, Vert:4, 34004
#COLUMNINFO= 11, mm, Vert:5, 34005
#COMPANYID= GeoDelft, 8000.97.476.B.01, 31
#DATAFORMAT= ASCII
#DATATYPE= REAL8
#MEASUREMENTCODE= GEF-IPDISP-Measurement, 1, 0, 0, ipdisp100.pdf
#MEASUREMENTVAR= 1, 5.000000, -, Number of points
#MEASUREMENTVAR= 2, 588.000000, pixel, Initial X position
#MEASUREMENTVAR= 3, 136.000000, pixel, Initial X position
#MEASUREMENTVAR= 4, 137.000000, pixel, Initial X position
#MEASUREMENTVAR= 5, 139.000000, pixel, Initial X position
#MEASUREMENTVAR= 6, 320.000000, pixel, Initial X position
#MEASUREMENTVAR= 7, 86.000000, pixel, Initial Y position
#MEASUREMENTVAR= 8, 268.000000, pixel, Initial Y position
#MEASUREMENTVAR= 9, 364.000000, pixel, Initial Y position
#MEASUREMENTVAR= 10, 458.000000, pixel, Initial Y position
#MEASUREMENTVAR= 11, 268.000000, pixel, Initial Y position
#REPORTDATAFORMAT= F7.1 F5.2
#STARTDATE= 2004, 12, 21
#STARTTIME= 17, 20, 57.680000
#TESTID= Piles 5
#TIMECOLUMN= 1, 1, s
#EOH=
  20.0 -0.04 -0.01 0.01 0.02 0.04 -0.03 -0.01 0.01 0.00 -0.01
  320.0 0.24 0.05 0.26 0.21 0.06 -0.23 -0.10 -0.01 0.06 -0.03
  620.0 0.41 0.10 0.44 0.33 0.10 -0.41 -0.18 -0.02 0.11 -0.04
  920.0 0.74 0.32 0.81 0.64 0.14 -0.75 -0.27 -0.03 0.26 -0.05
 1220.0 0.82 0.40 0.91 0.72 0.16 -0.98 -0.31 -0.06 0.25 -0.05
 1520.0 0.88 0.45 0.98 0.76 0.17 -1.16 -0.36 -0.09 0.25 -0.04
 1820.0 1.13 0.59 1.34 0.96 0.23 -1.43 -0.42 -0.12 0.33 -0.05
 2120.0 1.24 0.68 1.48 1.06 0.27 -1.68 -0.48 -0.17 0.36 -0.06
 2420.0 1.34 0.74 1.60 1.12 0.30 -1.91 -0.52 -0.23 0.36 -0.06
 2720.0 1.44 0.78 1.67 1.18 0.31 -2.09 -0.58 -0.27 0.36 -0.06
 3020.0 1.47 0.82 1.74 1.22 0.32 -2.28 -0.62 -0.33 0.35 -0.07
 3320.0 1.52 0.86 1.80 1.28 0.34 -2.41 -0.64 -0.36 0.34 -0.07
 3620.0 1.68 1.02 2.10 1.49 0.38 -2.69 -0.72 -0.42 0.41 -0.06
 3920.0 1.76 1.08 2.23 1.57 0.41 -2.91 -0.76 -0.47 0.44 -0.08
```

4220.0	1.86	1.15	2.35	1.64	0.43	-3.13	-0.79	-0.51	0.45	-0.08
4520.0	1.93	1.20	2.44	1.70	0.44	-3.29	-0.82	-0.56	0.45	-0.10
4820.0	2.01	1.24	2.50	1.75	0.45	-3.45	-0.85	-0.61	0.45	-0.09
5120.0	2.06	1.27	2.59	1.80	0.46	-3.62	-0.89	-0.66	0.43	-0.09
5420.0	2.11	1.29	2.66	1.84	0.46	-3.75	-0.92	-0.70	0.43	-0.09
5720.0	2.16	1.31	2.71	1.87	0.48	-3.91	-0.92	-0.73	0.41	-0.08
6020.0	2.31	1.38	3.04	2.23	0.58	-4.17	-1.04	-0.83	0.51	-0.11
6320.0	2.43	1.48	3.53	2.68	0.72	-4.62	-1.10	-1.00	0.65	-0.13
6620.0	2.51	1.56	3.76	2.89	0.76	-4.92	-1.14	-1.11	0.68	-0.14
6920.0	2.56	1.60	3.88	2.97	0.80	-5.13	-1.19	-1.19	0.67	-0.14



Reportdataformat has been added in order to provide a pleasantly readable layout of the data block.

3 General

In the next sections the commonly used keywords are briefly described. For an extended description is referred to www.geffiles.org/language/index.html. The type of file is a registration of a single transducer.

3.1 Compulsory keywords

This type of keywords should always be present in a GEF file, irrespectively of the standard used. The order of appearance of nearly all keywords does not matter. Exceptions are GEFID which should be the first keyword of the header and EOH which should be the last keyword of the header.

#GEFID = release, version, update

States the type of file: a GEF file. Currently the release, version and update of a GEF file can be either 1, 0, 0 or 1, 1, 0. This keyword should be the first keyword in the header.

#COLUMN = n

The number of columns, n is max. 250

#COLUMNINFO = i, unit, quantity, quantitynumber

Provides information for the i-th column. Which unit (e.g. kPa) and which quantity (e.g. pore pressure) has been reported. The quantity number is an identification for the type of quantity and specific transducer. It allows for an easy automatic recognition, irrespectively of the language and spelling of the quantity. The number of lines with COLUMNINFO in the header should be exactly the same as the number of columns, reported in COLUMN.

#FILEDATE = yyyy, mm, dd

The date on which the file was generated: year, month and day. yyyy should be Y2k compliant.

#PROJECTID = type[, number[, subprojectnumber]]

Projectidentification. The first field is compulsory, the second and third field are optional. It identifies the company that has performed the measurements. Usually type is CO (commercial), number is the project number, and subprojectnumber is what it describes: the number of the subproject.

#FILEOWNER = name

The name of the person responsible for the header and data in this file.

#EOH=

Marks the end of the header, no other keywords may follow this keyword. After the = sign of #EOH= a carriage return and linefeed (Windows) or linefeed (Unix) is added. The data follows the linefeed immediately.

3.2 Compulsory keywords for a standard.

The keywords are strictly spoken, not compulsory for a correct GEF file, however for the correct interpretation of this specific type of measurement, these keywords are vital.

#PROCEDURECODE = code, release, version, update, referencedocument

The code states which method of measuring, analysis, filing and reporting has been followed or should be followed. Release version and update provide information about the updates in the past: which specific method has been followed. The referencedocument refers to a written

document, in which the standard is described. It can be a document, as written by the user itself, but it may be an official document of e.g. ASTM, NEN or ISO as well.

#MEASUREMENTCODE = *code, release, version, update, referencedocument*

The code states which method of measuring has been followed or should be followed. Release version and update provide information about which version of the measuring standard has been used. The reference document refers to a written document, in which the standard is described. It may be an official document of e.g. ASTM or ISO, or a chapter of the quality manuals of a company.

#COMPANYID = *Name of the company, VAT number, country code*

Identifies which company has created the file. The VAT number is a unique code which is used in the countries of the European union by the government (Finance department) to identify a company. The country code is equal to the international access number for a country. The Netherlands is 31, Belgium is 32, UK 44, Germany 49 etc.

#MEASUREMENTVAR = *i, value, unit, quantity*

Provide information on static data: its value, its unit and which quantity has been measured. Maximum of 1500 measurementvars.

#STARTDATE = *yyyy, mm, dd*

The year, month and date a test has started. It may be used as a zero date, e.g. January 1th, 2000. yyyy should be Y2k compliant.

#STARTTIME = *hh, min, sec*

The hour, minute and second the measurement has started. It may be used as a reference time, e.g. 00, 00, 0.0

#TESTID = *Alias*

A nickname of the transducer, e.g. pore pressure transducer nr. 5 in row 17.

3.3 Optional keywords

As a matter of fact all keywords not mentioned above are optional. One is free to add them, but do not expect a specific meaning, since there has been no arrangement for these keywords in the context of the standard. Merely for cosmetic purposes.

