



Itasca

# Soft Spot<sup>tm</sup>

## Itasca Software Newsletter

Volume 1, Number 1

Winter 1993

### Welcome

Today Itasca's software can be found in nearly forty countries around the world. Over 500 organizations are using *FLAC* and over 200 are using *UDEC*. As the popularity of Itasca's products continues to grow, we recognize the need for Itasca software users to be kept abreast of the latest modifications and advancements we are making to our codes. Also, we believe it is important to provide a forum to share modeling experiences so that users can learn better techniques to apply our software for their particular analysis.

With this newsletter we hope to begin providing this service to Itasca software users. We welcome your input in this endeavor. Please let us know what you would like to see in the newsletter. We would also be glad to know of modeling results or hints which you would like to share. *Soft Spot* is your opportunity to put Itasca software on the spot.

Roger D. Hart  
Director, Software Services

### New Development

*FLAC-3D* is under development! Peter Cundall and Itasca staff have begun developing a new three-dimensional explicit finite difference program which extends the application of 2-D *FLAC* to three dimensions. This also includes the incorporation of the *FISH* language processor. A major new feature will be a full interactive graphics user interface for both input and output. The projected release date for *FLAC-3D* is January 1994. We will continue to update you as this development progresses.

### Software Workshops

We are planning to conduct an Itasca software workshop in Minneapolis and/or in the United Kingdom sometime during the summer of 1993. The scope of the workshop is not finalized and we are open to users' suggestions. If you are interested in attending, please let us know which location you would prefer and what topics would be of special interest to you.

## Itasca is Moving

As of February 1, 1993, Itasca will be located in new offices at the following address:

Itasca Consulting Group, Inc.  
Thresher Square East  
708 South Third Street, Suite 310  
Minneapolis MN 55415 U.S.A.

Telephone: (1) 612-371-4711  
Telefax: (1) 612-371-4717  
BBS: Not yet available.

## BBS Service

We have recently installed a Bulletin Board Service (BBS) to help users send questions and files to us. We are also evaluating other electronic mail systems and would appreciate any comments or recommendations you may have. We hope to improve this service based upon users' needs. Please let us know if you would like more information on the BBS.

## Software Q/A

Answers to the more common questions submitted to Software Support.

**Q:** Why must the elastic moduli be entered as a bulk modulus,  $K$ , and shear modulus,  $G$ , in Itasca codes?

**A:** We do this to make sure the user carefully evaluates the elastic properties which are selected for an analysis. For example, Young's modulus  $E$  becomes undefined for a material with Poisson's ratio  $\nu$  of 0.5. Bulk modulus,  $K$ , however is still finite at  $\nu = 0.5$  because  $K$  records volumetric stiffness. It is usually not a good idea to calculate  $K$  from  $E$  and  $\nu$  when  $\nu$  approaches 0.5, because the computed  $K$  will be unrealistically high and will make the solution process very inefficient. It is better to fix the value of  $K$  at its known physical value and then compute  $G$  from  $K$  and  $\nu$ .

With this said, however, please note that in *FLAC* it is possible to use *FISH* to enter  $E$  and  $\nu$  directly (See Volume I, Chapter 7 of the *FLAC* 3.2 manual.).

**Q:** What is the difference between *UDEC* joints and *FLAC* interfaces?

**A:** The mechanical behavior of joints in *UDEC* is almost identical to that of interfaces in *FLAC* (although there are a few minor differences that are unimportant for most applications). However, *UDEC* joints are much easier to specify: you can create interaction surfaces between two bodies by giving a single **SPLIT** or **CRACK** command. Using *FLAC*, by contrast, you must first create the shape of two bodies, bring the bodies together and then specify exactly which gridpoints are to touch one another (and also guess what contacts are likely to touch in the future). *UDEC* automatically detects the possibility of contact between surfaces at all times, without user intervention.

So, if your problem has one or two non-intersecting interfaces, then the task of creating them with *FLAC* is quite easy. But multiple interfaces, particularly if they intersect, require a formidable effort to set up in *FLAC*; the job is considerably simpler in *UDEC*. The numerical results produced by either should be very similar.

**Code Agent Information**

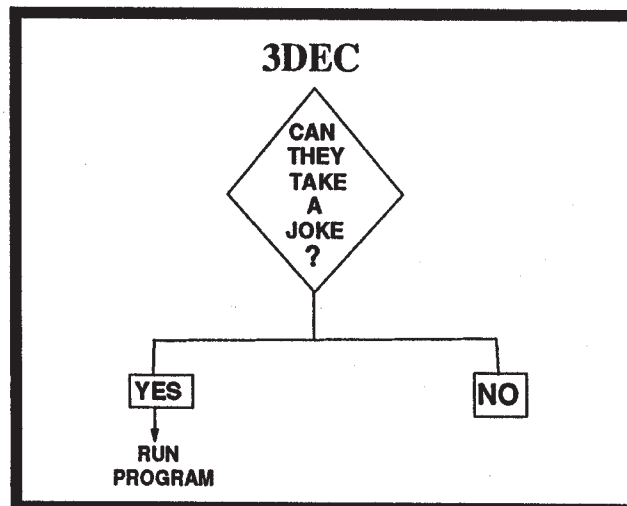
For your information, Itasca has two offices in Europe and eleven software distributors around the world. Itasca agents are:

Itasca Geomekanik AB  
 Hyttgatan 48 C  
 S-791 60 Falun  
 Sweden  
 Phone: 46-23-169 60  
 Telefax: 46-23-198 04

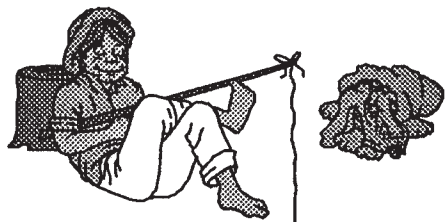
Itasca Consultants, s.a.  
 40 avenue Guy de Collongue  
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Country	Name	Fax Number
Australia	CSIRO Division of Geomechanics	61-3-803-2052
Brazil	Roberto Kochen	55-11-829-9418
Finland	Saanio & Reikkola OY	358-0-566-3354
Hong Kong	Fong On Const. & Eng. Co., Ltd	852-838-0011
Italy	Centro Di Analisi Strutturale (CeAS)	39-22-940-6706
Japan	Oyo Kogaku Laboratory Inc. (OKL)	81-3-3485-6955
	CRC Research Institute, Inc. (CRC)	81-6-241-4136
Korea	Dong Myeong Engineering Consultants	82-2-924-0154
Southern Africa	Mining Stress Systems (PTY) Ltd.	27-1207-71356
Taiwan	Integrate Systems, Inc.	886-2-704-5840
U.K.	Mott MacDonald Civil Foundations & Geotechnics Division	44-81-681-5706

**SOFT SIDE**



**Gone fishin'...** (Simple tricks with *FISH*)



Sometimes it is useful to plot a graph of *FLAC*'s results with some other software package (e.g. Lotus 123). For this, we need a file containing columns of numbers in ASCII format. Although *FLAC*'s histories can be dumped to a file in this manner, line plots cannot. For example, we might want to plot a profile of the horizontal displacement versus height of an embankment. You can use *FISH* to write out two columns of numbers that are saved on the log file. The following *FISH* function *SCAN* writes the y value and the x displacement of gridpoints along the column  $i = icol$ .

```
def scan
  loop jj (1,jgp)
    s1 = string(y(icol,jj))
    s2 = string(xdisp(icol,jj))
    junk = out(s1 + ' ' + s2)
  end_loop
end
```

As an example in its use, we allow an elastic block to compact under gravity:

```
grid 10 10
model elas
pro dens 1000 shear 1e8 bulk 2e8
fix x y j=1
set grav 10
step 500
set log on icol=1
scan
```

The log file now contains two columns of numbers (plus some extraneous lines that we discard):

```
0.0000E+00 0.0000E+00
1.0000E+00 -2.9221E-04
2.0000E+00 -3.8820E-04
3.0000E+00 -4.1331E-04
4.0000E+00 -3.9452E-04
5.0000E+00 -3.5041E-04
6.0000E+00 -2.9227E-04
7.0000E+00 -2.2746E-04
8.0000E+00 -1.6115E-04
9.0000E+00 -9.7335E-05
1.0000E+01 -4.2521E-05
```

We can import these columns into a commercial graph-plotting program. The function can easily be modified to scan a particular line in space, rather than an *i*-line. The function will only work with *FLAC* version 3.2, but it can be modified to work with earlier versions, by storing the data in a table which is then printed out.

**Soft Spot**

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