GUI Design

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Outline

- Background
- Script languages for GUIs
- GUI design do's & don'ts

Why use a GUI?

GUI = Graphical User Inferface

- A well-designed GUI speeds learning
  - Opens software to occasional users & novices
- Scaleable: offers power tools to experts

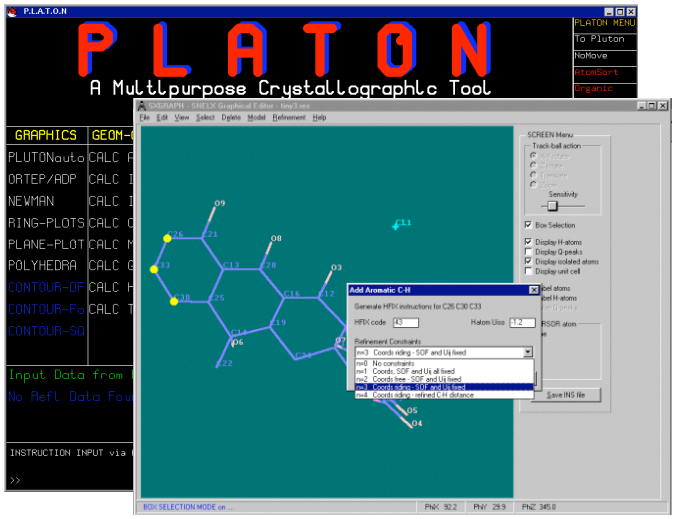
Portable GUIs

Windows only?

Support for Linux & Mac offers wider range of users & growth into parallel processing

Portable GUI tools

- Compiled (usually C++) packages
  - FLTK (www.fltk.org)
  - wxWidgets [nee wxWindows] (www.wxwidgets.org)
- Virtual Machine
  - Java
- Script languages
  - Python + Tk, +wxWidgets, +GTK
    - GUI Builders: wiki.python.org/moin/GuiProgramming
  - Tcl/Tk (www.tcl.tk & comp.lang.tcl)



Pros & cons of scripting

Pros
- Easy to code
- Test small routines
- Extensible when speed is needed
- Highly portable
- Add code at run time

Cons
- Slower than compiled code
- Debugging can be non-trivial

IMHO 1: GUIs do not need tremendous speed

- GUIs interact with people, who cannot tell the difference between a 10 μsec vs a 50 millisec screen paint

IMHO 2: Where possible don't incorporate code into script language, use external programs

When more extensive computations are needed, one can pass information to an external program, run it & read back results
- More portable
- Easier to debug
- More than fast enough: overhead of write, fork & read is usually trivial

Example: Calling an external program

CMPR EditCell replaced SGI GL program MANDEX: animate powder diffraction line positions
- 1st draft: run FORTRAN program each time slider is moved
  - Fast enough
- Final version: modify FORTRAN output for direct parsing by interpreter
  - Even faster!

1st vs. 2nd gen. output

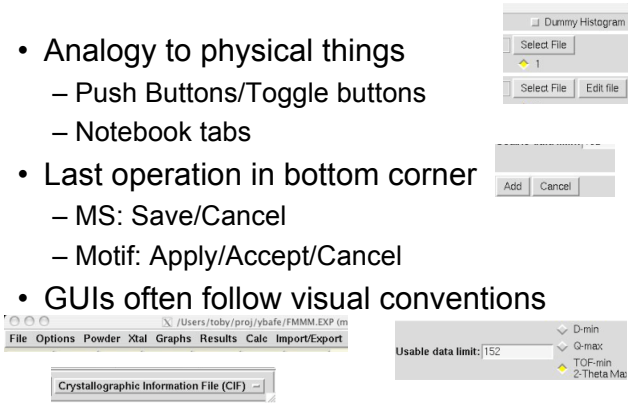
```
 ICD      H      K      L  MULT
  11      0      0      1     2 --    1  17.7176   5.00000
  11      0      1      1     2 --    2  28.5434   3.12348
  11      1
  11      1
  11     -1
  11      0
  11      1
  11     -1
  11      0
  11      1
  11     -1
  11      0
  11      1
```

```
set dgen1(x) {
  17.7129707  22.191597  28.5358257  29.7368317
  34.8244629  35.8678513 37.4165802  41.6833496
  42.5831184  45.2750664  47.2591591 48.9819603
}
set dgen1(h) {
   0  0  1  1 -1  0  1 -1  0  1 -1  0
}
set dgen1(k) {
   0  1  0  0  0  0  1  1  1  0  0  2
}
set dgen1(l) {
   1  1  0  1  1  2  1  1  2  2  2  1
}
```

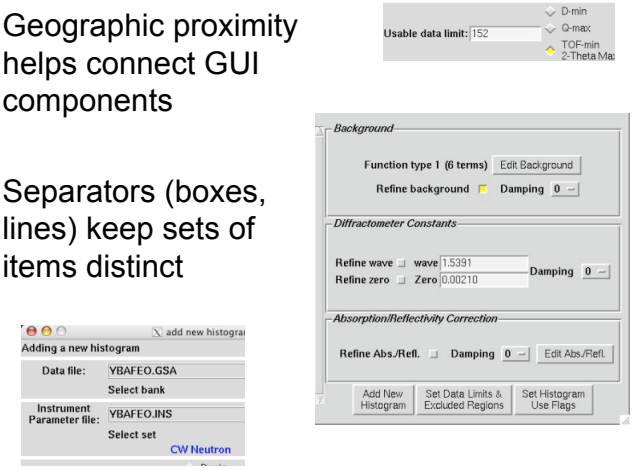
Thoughts on GUI design

2nd Generation GUIs depend on a visual short-hand

- Analogy to physical things
  - Push Buttons/Toggle buttons
  - Notebook tabs
- Last operation in bottom corner
  - MS: Save/Cancel
  - Motif: Apply/Accept/Cancel
- GUIs often follow visual conventions

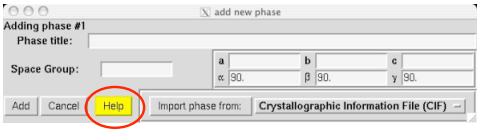


- Geographic proximity helps connect GUI components
- Separators (boxes, lines) keep sets of items distinct



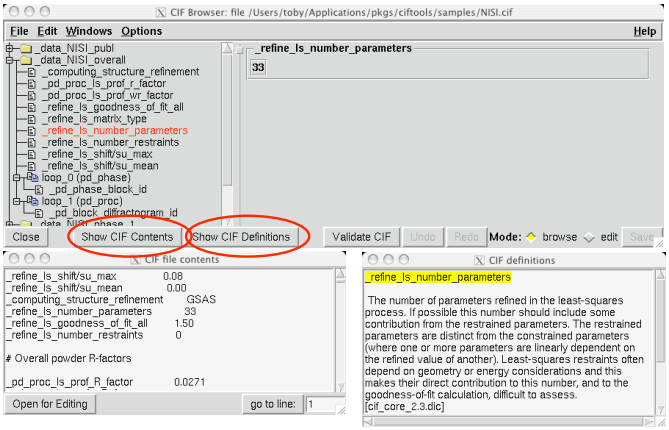
Other Design Goals

- Screen space is valuable - don't waste it
- A little bit of color helps guide the eye
- Too much color is confusing
  - Keep contrast levels high (have pity on the color blind)
- Try to use color consistently

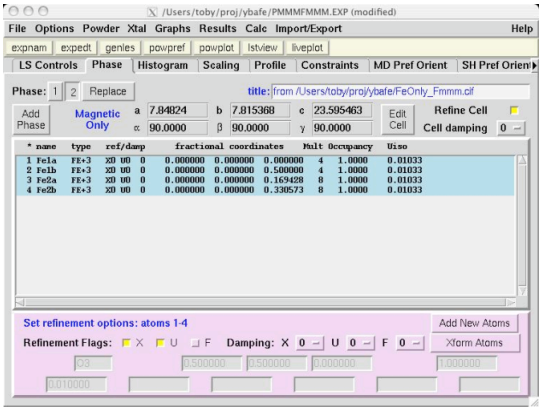


GUI design: Hall of Fame & Shame

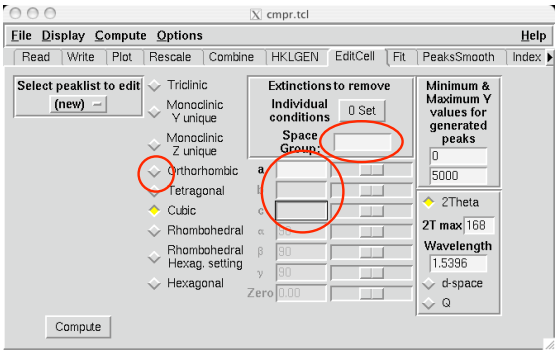
CIFEDIT: not simple but easy



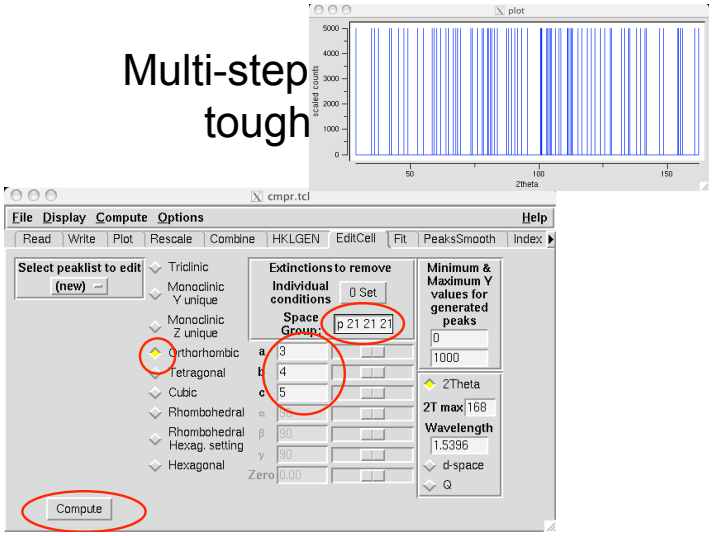
Another of my "greatest hits" EXPGUI



Multi-step processes are tough with GUIs



Multi-step tough



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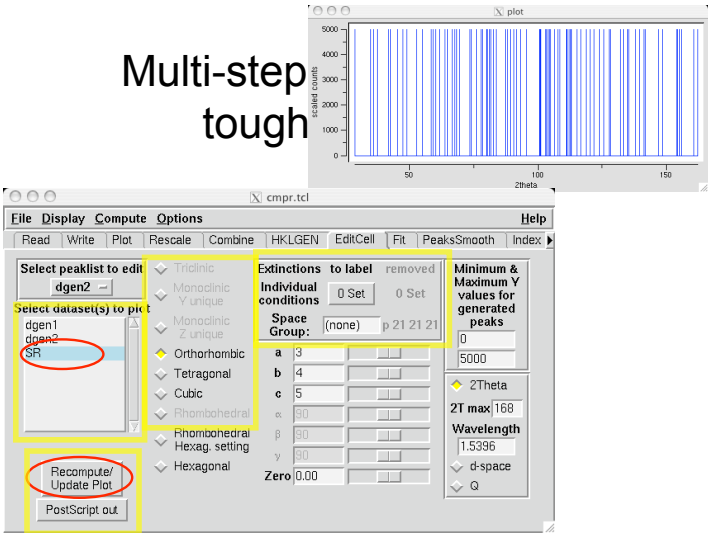

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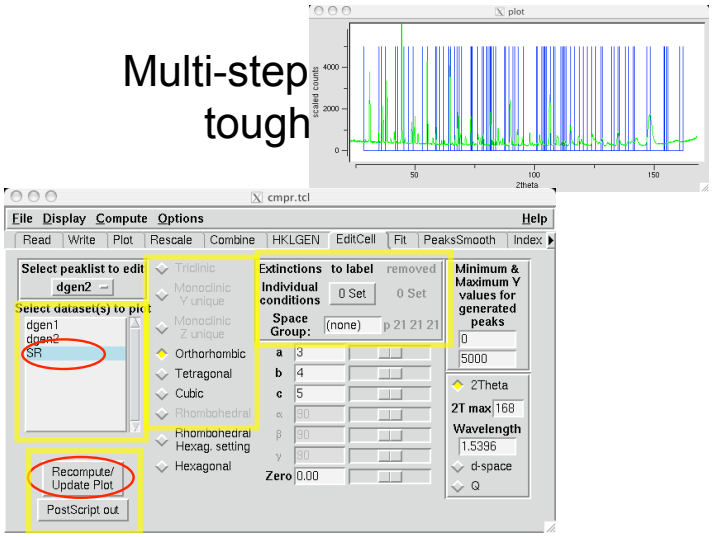

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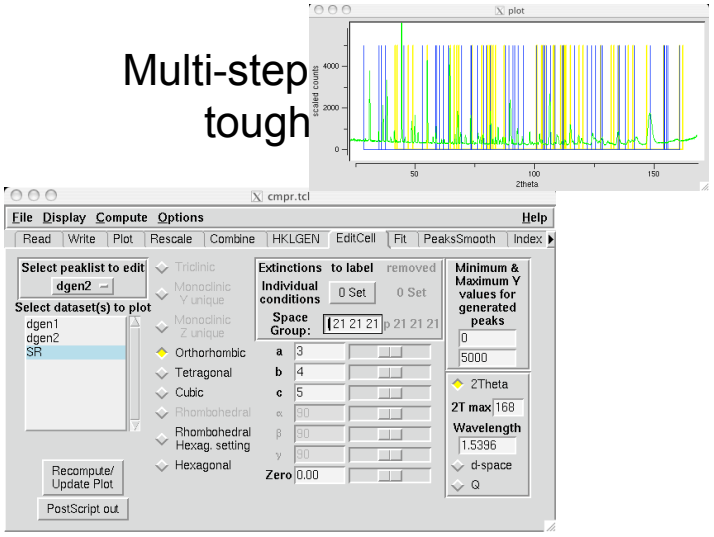
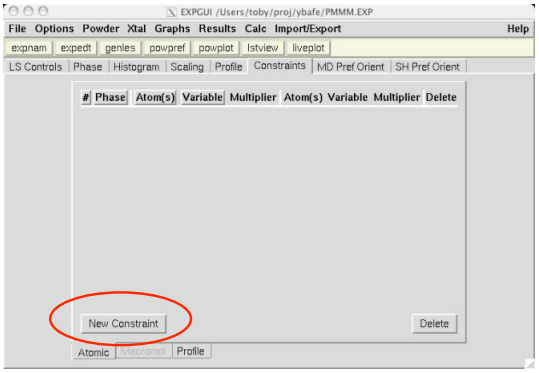


I don't know how to make this more intuitive



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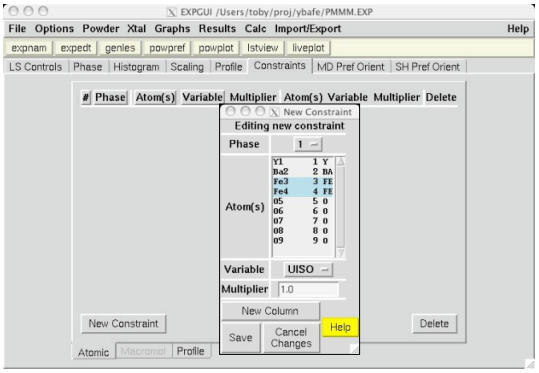

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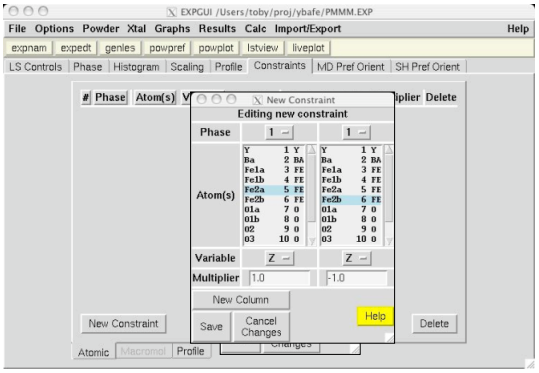

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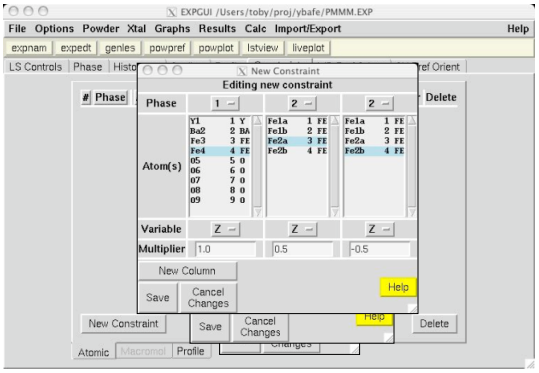

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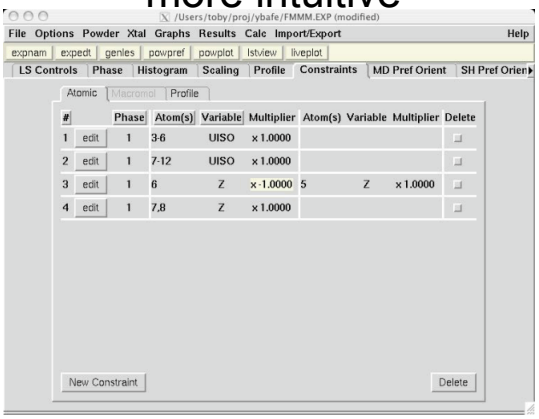
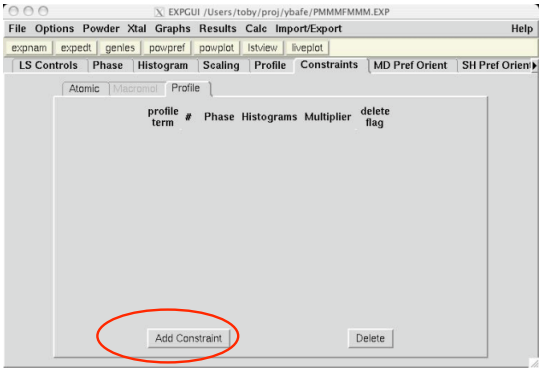


Even worse



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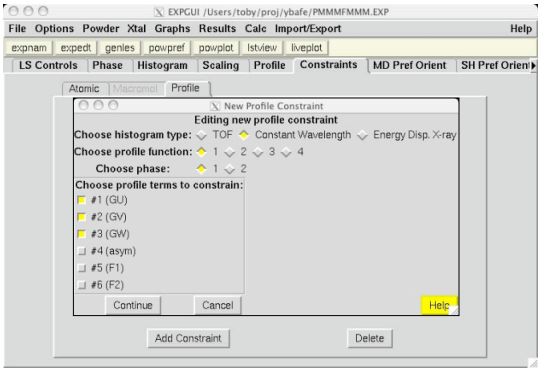

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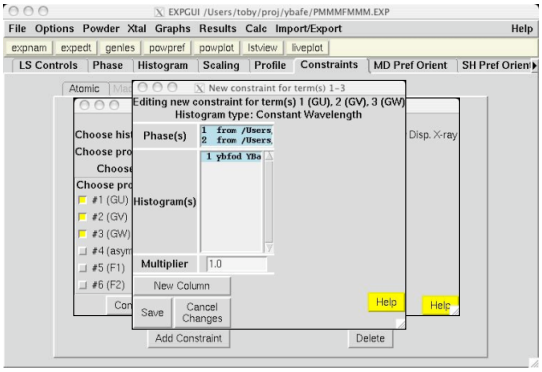

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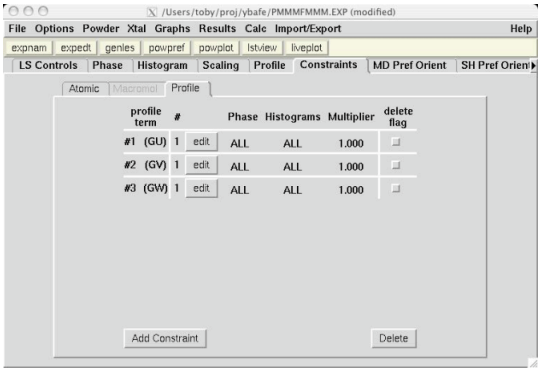

Conclusions

- Script languages are great for portable GUI design
- Intuitive GUIs take considerable thought
- Use conventional designs where possible
- Multi-step procedures are tough to make intuitive
  - Tutorials help
- Users really like GUIs