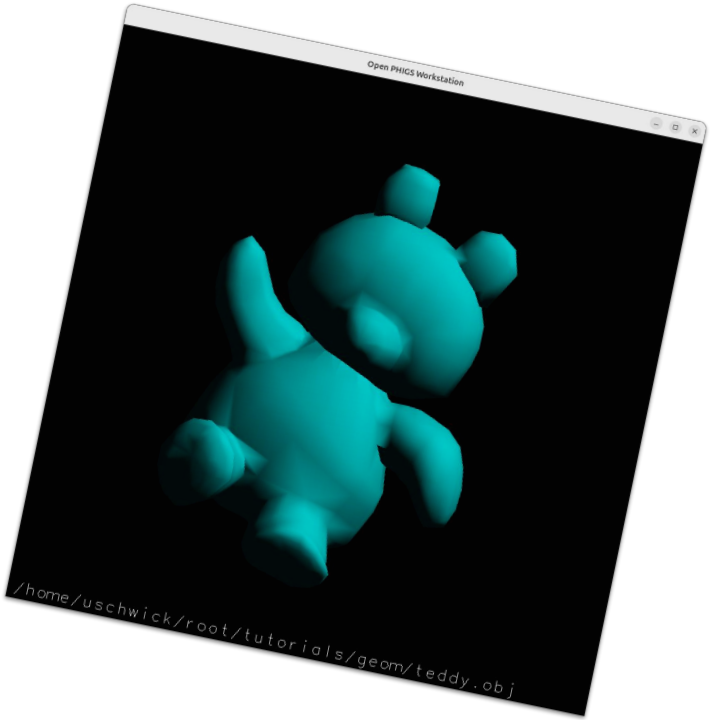
Recovery of DELPHI and OPAL event displays: the PHIGS story

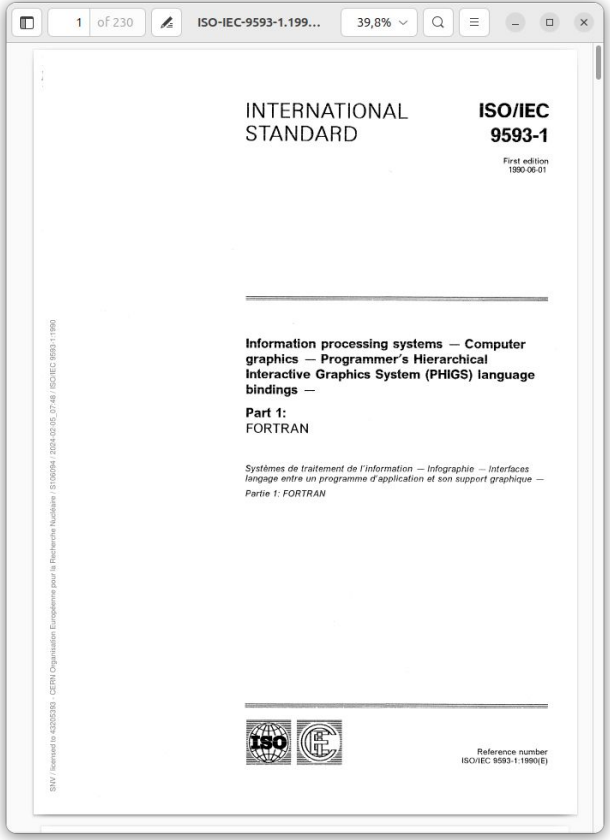
- What, roughly, is PHIGS ?
- OpenPHIGS for data preservation
  - What it is and what is supports
  - What had to be changed
  - Caveats



Teddy bear .obj 3d file from root examples, rendered with OpenPHIGS

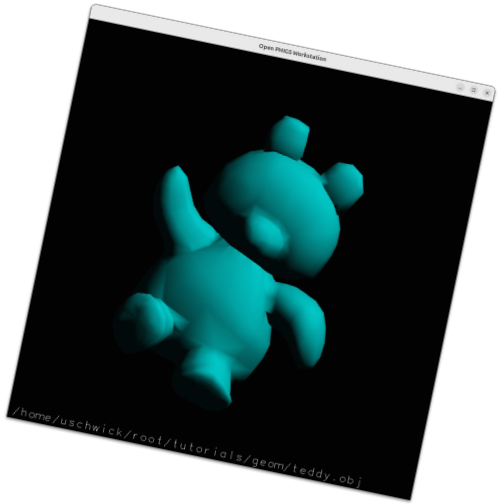
What, roughly, is PHIGS ?

- PHIGS: ISO 3d graphics standard, defined in:
  - ISO-IEC-9593-1.1990 Fortran bindings
  - ISO-IEC-9593-4.1990 C bindings
- Build on top of PEX, the PHIGS extension for X11
  - PEX **didn't make it** to the most recent X11 versions
  - PHIGS lost the battle against OpenGL
- Some LEP experiments used GPHIGS, a commercial and closed source implementation, for their event displays
  - Powerful pretty complete implementation, supporting both C and Fortran bindings
  - Worked without the PEX X11 extensions
  - GPHIGS builds may still be available on request but at **significant license cost**, specifically for experiments which **no longer have any funds**



What is OpenPHIGS?

- In 2012 a **pre-alpha level prototype implementation** with an OpenGL based backend was uploaded to SourceForge
  - https://sourceforge.net/projects/phigs/files/
  - Licenses used: LGPL and Apache 2
- Features:
  - Backend based on OpenGL
  - Mostly C-bindings, incomplete with respect to the standard
  - Very few Fortran bindings only, at a proof of concept level
  - No documentation / man pages



- After an initial review of this code, it became clear that the available code is by far insufficient to serve as a GPHIGS replacement

OpenPHIGS for data preservation ?

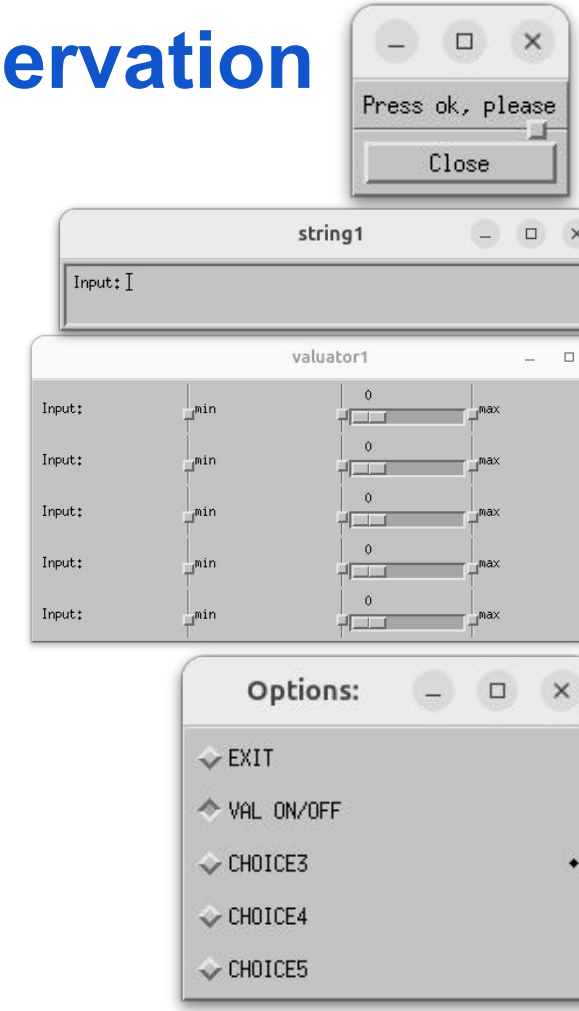
- The same (or very similar code) was uploaded to github
  - https://github.com/n1ckfg/Phigs uploaded 6 years ago
  - https://github.com/phigsfan/OpenPHIGS uploaded 10 months ago
- 4 years ago, a more advanced version of OpenPHIGS was put on github: https://github.com/fbradasc/OpenPHIGS
  - More complete set of C bindings
  - Quite some documentation, in the form of man pages
  - However:
    - **PEX backend only,** thus it compiles but does - nothing
    - **No Fortran bindings** at all
  - Nice additional source of information, but not usable for our purpose as such

OpenPHIGS for data preservation !

- **Decided to start from** https://sourceforge.net/projects/phigs/files/
- Significant work on the OpenGL backend implementation
  - E.g. adding shaders, to support detector cutting as done by the DELPHI event display
- Implementation of the required Fortran bindings
  - **Added 138 Fortran functions** (12 already existing)
  - In most cases, these are simply wrappers for the corresponding C- bindings
- **Reverse engineering** of remaining bindings
  - From DELPHI and OPAL displays source codes
  - From the available documentation

OpenPHIGS for data preservation

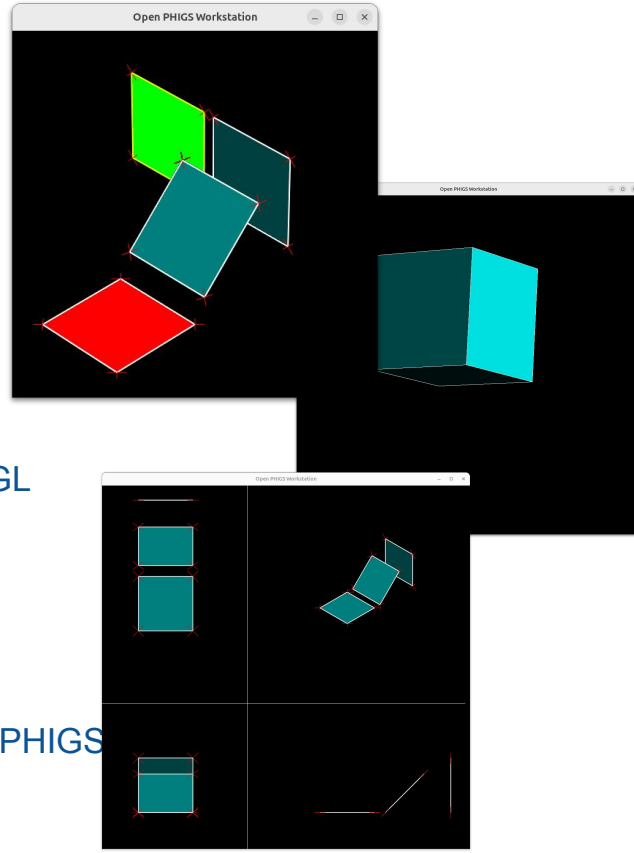
- Implementation of **input devices**, needed by OPAL
  - Starting from existing dead code in the prototype using Athena widgets
  - Adding support for Motif
  - Implemented **String input**, **valuator** and **choice widgets**
- Some extensions
  - A function to read an external configuration file to initialise OpenPHIGS
  - A new Fortran function PSALCH which sets the current color ALPHA channel value, adding transparency
  - New workstation types to create screenshots as TGA or PNG, in black/white, color, with or without transparency



OpenPHIGS for data preservation

Caveats:

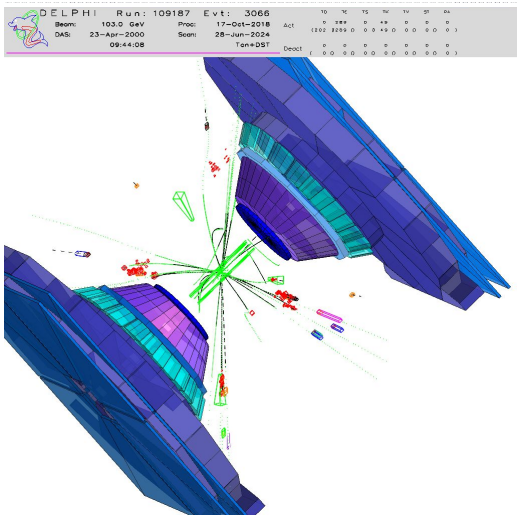
- Had to drop some functionality
  - Printing as PostScript is not possible
  - Replaced by TGA or PNG which is not the same resolution wise
- Still incomplete implementation
- Still bugs to be solved
  - E.g. filling only works for concave surfaces, as is the case in OpenGL
- Not fully compliant to the standard
- Still at pre-alpha level in terms of code maturity
- Still no documentation
  - Could import a subset of the man pages from the PEX based OpenPHIGS implementation
- Eventually not the same look and feel as with the original

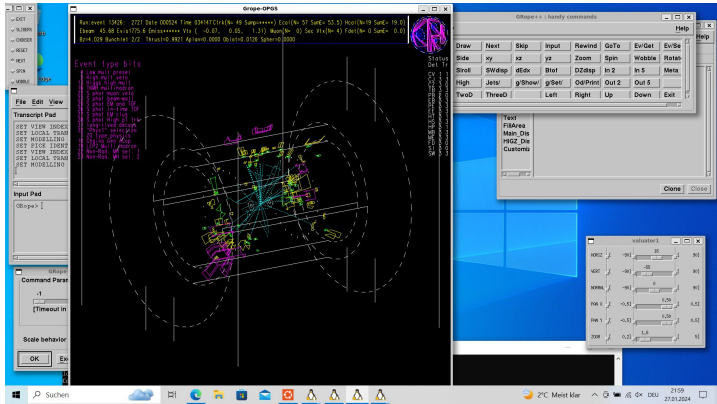


OpenPHIGS for data preservation !

Good enough for DELPHI and OPAL data preservation

- Fully open source
- Works for both event displays
- Works in both 32bit and 64bit, on recent Linux versions
- Binaries currently shipped with DELPHI and OPAL software stacks





Latest version:

https://gitlab.cern.ch/delphi/openphigs