Graphics!

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"Le secret d'ennuyer est celui de tout dire."
Voltaire

1 Introduction

Perhaps nothing in physics' modeling is more exciting or satisfying than visualising one's simulation. Moreover, visualisation can be employed as a debugging tool to check geometry construction and the physics of the simulation. Since EGS4 is an analogue code, it is quite adaptable to viewing simulations on a history-by-history basis. There are several general-purpose graphics packages that are available.

- `SHOWGRAF` from SLAC, developed by Ray Cowan and Ralph Nelson [1]
- `SHOW` from NRCC developed by Chris Mangin and Alex Bielajew
- `EGS_Windows Version 1` from NRCC developed by Paul Wiebe and Bielajew [2]
- `EGS_Windows Version 2` from LBL (Lawrence Berkeley Laboratory) developed by Sandeep Chatterjee and Rick Donahue
- `EGS_Windows Version 3` from NRCC developed by Stan Zurawski and Bielajew
- `EGS4PICT` from KEK (National Laboratory for High Energy Physics, Japan) developed by Hideo Hirayama, Yoshihito Namito, Syuichi Ban, Renzo Ikeda and Yukio Tokuda [3].

These notes describe the basic features of the above packages, what hardware/software is required and how to get them.

2 `SHOWGRAF` from SLAC

The `SHOWGRAF` package is a set of auxiliary subprograms that attach to EGS4 usercodes. The graphics library employed by `SHOWGRAF` is also a product of SLAC, called Unified Graphics. It is a public-domain release and is distributed freely with `SHOWGRAF`. Two modes of operation may be employed. The interactive version employs an IBM 5080 graphics terminal. This version runs EGS4 interactively allowing 3D rotation, pan and zoom. Geometries are depicted with wireframes and particle species are distinguished by colour (photons are yellow, electrons are green and positrons are red). There is an option to scale the intensity of the lines depicting the tracks by the energy of the particle along the track. The geometry may be globally displayed or switched off and the representation of a given species may be switched on or off. The non-interactive version is implemented by allowing `SHOWGRAF` to record a two-dimensional projection of the shower in a device-independent file. This file can then be converted into a device-dependent file to produce hardcopy.

This package can be obtained from the authors by contacting them by mail (Stanford Linear Accelerator Center, Stanford California 94309) or by e-mail from the following addresses:
Cowan: `rfc@unixhub.slac.stanford.edu` Nelson: `wrnrp@slacvm.slac.stanford.edu`

3 `SHOW` from NRCC

`SHOW` was developed as a poor-man's version of `SHOWGRAF`. It produces only monochrome graphics for Tektronics 4010 and VT240 terminals and hardcopy to Imagen laser printers. It is based upon the PLOT10 2D graphics package and has only been tried on a VAX computer. Besides lacking colour, there is no intensity scaling with energy. The extra features are labeling, marking interaction points along a particle track and marking points along particle tracks where the transport is interrupted for any reason. As well, this code is a 3D post-processor to EGS4. A history file containing the 3D vertices must be generated by the code. This is a standard feature of many NRCC codes, `dosrz` for example.

This code is distributed but not supported by the author.

4 `EGS_Windows Version 1` from NRCC

`EGS_Windows Version 1` grew out of `SHOW` incorporating all the features of `SHOW`, and adding most of the features of `SHOWGRAF` except for interactive running of EGS4. The major enhancement is solids modeling of the geometry. This code runs on Sun computers and uses the SunView graphics environment. The 3D graphics library employed is SunPHIGS 1.2, an enhanced version of the PHIGS 3D standard. The limitations of this code are that the colours are fixed (photons are yellow, electrons are green and positrons are red) and there are a small number of colours available for the solids. However, a good set of solid objects can be modeled, cylinders, planes, an arbitrary 5-point object rotated about a fixed axis (a right cylinder is a 2-point object rotated about a fixed axis), four and six-sided polygons. A single light source illuminates the object. Both orthographic and perspective views are modeled.

This code is distributed by the author and is part of the standard unix distribution.

5 `EGS_Windows Version 2` from LBL

`EGS_Windows Version 2` is a version of `EGS_Windows Version 1` that runs under Motif/X with the SunPHIGS 2.0 3D library. The solids modeling and perspective viewing has been eliminated but the code should be more transportable than `Version 1`. However, the user interface is friendlier and the colours of the particles can be changed easily. This code is also distributed by the author and is part of the standard unix distribution.

6 `EGS_Windows Version 3` from NRCC

The most sophisticated graphics program so far has just recently been completed. It runs on Silicon Graphics machines and is coded using the GL graphics library. In many respects it combined the best features of Versions 1 and 2 including solids modeling with transparency, arbitrary colour definition of all objects and a very flexible user interface. The code is available from the author.

7 `EGS4PICT` from KEK

This is a PC post-processing graphics package that runs under Microsoft Windows. It has an easy-to-use and intuitive graphical interface, using constant-density colour lines for particles and wireframes for the geometry. This code is available by anonymous ftp. Contact Hideo Hirayama (HH02@kekcc.kek.jp) for instructions on how to receive this code.

References

[1] R.F. Cowan and W.R. Nelson, "Producing EGS4 Shower Displays with the Unified Graphics System," Stanford Linear Accelerator Center Report SLAC-TN-87-3 (Stanford Calif) (1987).

[2] A.F. Bielajew, and P.E. Weibe, "EGS-Windows - A Graphical Interface to EGS," NRCC Report: PIRS-0274 (1991).

[3] H. Hirayama, Y. Namito, S. Ban, R. Ikeda and Y. Tokuda, "EGS4 Shower Display System, EGS4PICT(2), Windows Version," National Laboratory for High Energy Physics Report KEK Preprint 94-10 (KEK, Japan) (1994).