

HL-LHC-HUD-2017-001
28/2/2017

Merlin Release with Hollow Electron Lens

Roger Barlow

1 Changes made

This version of Merlin is the one previously released on SourceForge as version 4.1. Two important changes have been made.

Firstly, it has been put into Eclipse. This is a widespread and popular IDE (Integrated Development Environment) used by many institutes, including CERN. (The move was recommended by the CERN group.) As well as providing a convenient working environment with the facilities that today's users have come to expect, Eclipse also has the benefit of taking over the compilation/linking infrastructure, avoiding the need for making make files which was an un-loved feature of the old Merlin

Secondly, the directory structure has been flattened. All routines are in the top directory. Although it may have made sense initially to group code files into separate subdirectories, as the program expanded it became less obvious which file went where, and much time was wasted trying to locate routines put into sub-sub-directories for reasons that were obvious once. The total number of files is large, but not so large as to be unmanageable with a system like Eclipse to help. Also there is a strong class/subclass system imposed on the code, and namespaces, so a separate directory/subdirectory hierarchical classification was confusing.

2 Changes not made

Some of the functionality added in the past few years, in particular the small angle nuclear scattering in collimators, is not included in this release. While there is a lot of hard work and useful features in these changes, and results have been published, they have not (all) been validated, or checked for timing issues.

Also there is a lot of code written in this area which is not in line with the clean object-oriented approach which characterised the original Merlin. I do not want the original author to regret his decision to hand custody of the software over to us, and the code must be put into respectable shape before going public with it.

3 Hollow Electron Lens

The Hollow Electron Lens collimation (written by Haroon Rafique [1]) has been included. This involves the new classes `HollowElectronLens`, `HollowELensProcess`, and `SymplecticHollowELensProcess`.

This has involved modifications to the `MADInterface` routine and to `ParticleDistribution`.

An example job `HollowElectronLensTest` is included in the release. The Symplectic version has not yet been fully tested, but this should be done soon.

4 Access

Read access to Merlin is available through `git` using the `ssh` connection method.

It was decided to host a private `git` server rather than the general `github`, as recommended practice [2] is to do so when hosting a single package. The repository server is reportedly much faster as it only has one package to consider whereas `github` may be slow.

`git` provides remote access by three methods: `ssh` is one, the others being `git` and `http`. There are reasons given for and against all three methods, however the clinching argument was that `ssh` proceeds through port 22 which is open in the relevant firewalls, as it has to be to allow remote login access.

The command is simply

```
git clone ssh://gitiaa1.hud.ac.uk/home/shared/Merlin.git
```

this will request a password, which is 'Merlin'¹ and the local Merlin repository will be created and filled.

Downloading the file from Huddersfield to CERN lxplus took 13.16 seconds (including typing the password), so, as desired, the speed is certainly not an issue.

5 Documentation

Instructions are available on <http://barlow.web.cern.ch/barlow/Merlin>. This includes instructions on how to download packages like `git` and `eclipse`, as well as specific instructions for Merlin. (This documentation was implemented and tested by James Fallon, a vacation student who worked with us over the Christmas period.)

6 Uploading

At some stage users will make changes to Merlin and want to upload them to the repository. We foresee this happening smoothly, thanks to `git`, and it will be implemented soon.

The Eclipse environment does in principle interface to the `git` distribution system, though the working methods are not completely intuitive. Write access,

¹ The `git` user has no login rights so this is not a security breach.

to enable several developers to work on the project, will be added in due course. `git` makes it regrettably easy for a project to diverge with different threads for different requirements, and it is not easy to bring them back together again: this is a matter of human engineering rather than anything that system software can fix. We will ensure that it is done coherently.

7 Conclusions

Progress has been slow due to the time it has taken to get the contract signed and hire a PDRA. They will be starting shortly, and thereafter progress should be smoother and faster.

8 References

- [1] H Rafique, *MERLIN for High Luminosity Large Hadron Collider Collimation*, Ph.D. thesis , The University of Huddersfield, (2016)
- [2] M. McCulloch and T. Berglund, *Mastering Git*, O'Reilly Media (2011)