Usage nutfilter

The program `nutfilter` is intended to be used as a filter to `geng` and should be called for examples like this

```
geng -cq 7  | ./nutfilter
```

Input is a list of `graph6` graphs. Output depends on command line options and is always to the standard output channel. Some statistics are sent to the standard error channel

- `./nutfilter` or `./nutfilter -n` outputs only the nut graphs that occur in the input
- `./nutfilter -s` same, with slower algorithm (for timings)
- `./nutfilter -r` outputs the rank of each input graph, in the same order as the input
- `./nutfilter -p` outputs the 'pseudo'-rank of each input graph, in the same order as the input

Usage nutgen

The program `nutgen` is an extended version of `geng` which incorporates our algorithm to generate nut graphs and is much more efficient than using `nutfilter`.

The command line arguments for using `nutgen` are the same as for `geng`.

Examples:

- `./nutgen 10 -d2` outputs all nut graphs on 10 vertices.
- `./nutgen 14 -d2 -D3` outputs all chemical nut graphs on 14 vertices (a chemical nut graph has degree at most 3).
- `./nutgen 11 -d2 -t` outputs all nut graphs on 11 vertices with girth at least 4.
- `./nutgen 14 -d2 -tf` outputs all nut graphs on 14 vertices with girth at least 5.

Geng

The program `geng` can be obtained from here.

Dependencies and installation

Nutgen uses the GNU Multiprecision Arithmetic Library. This library can be installed on ubuntu with the following commaind

```
sudo apt-get install libgmp3-dev
```

Nutgen uses a library `libpgeng.a` which must be stored in the `libs` directory and may be machine

dependent. This library must be built from the nauty distribution, as follows:

- Copy the files `pgeng.c`, `pgeng.h` and `makefile-pgeng` from the `libs` directory to the nauty source directory.
- In that source directory, run `make -fmakefile-pgeng`
- This generates the file `libpgeng.a` in that source directory
- Copy this file to the `libs` directory of this project
- You may then run `make -fmakefile-pgeng veryclean` to clean up the generated files

The program `positionzero` which determines the position of the NBO uses the GNU Scientific Library.

- Download, configure and make the latest version of gsl.
- `LD_LIBRARY_PATH` should point to the location where the gsl libraries are installed. In most cases this will be: `export LD_LIBRARY_PATH=/usr/local/lib`
- Make using `make positionzero`