README

xint 1.3c

2018/06/17

```
Source:  xint.dtx 1.3c 2018/06/17 (doc 2018/06/17)
Author:  Jean-Francois Burnol
Info:    Expandable operations on big integers, decimals, fractions
License: LPPL 1.3c
```

This `README` is also available as `README.pdf` and `README.html`.

Change log is to be found in `CHANGES.pdf` or `CHANGES.html`.

The user manual is `xint.pdf`, and the commented source code is available as `sourcexint.pdf`.

Aim

The basic aim is provide *expandable* computations on integers, fractions, and floating point numbers. For example

`\xinttheexpr reduce(37189719/183618963+11390170/17310720)^17\relax`

will evaluate exactly the fraction; the result has 462 characters (including the fraction slash.) One can also work with dummy variables:

`\xinttheexpr mul(add(x(x+1)(x+2), x=y..y+15), y=171286,98762,9296)\relax`

evaluates to 15979066346135829902328007959448563667099190784.

Float computations are possible at an adjustable precision (default 16).

`\xintDigits:=48;\xintthefloatexpr 123_456_789^1_000.5\relax`
`->3.63692761822782679930738270515740797370813691938e8095`

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(as this example shows the underscore character can be used to separate visually digits, one can also use the space character for that purpose).

Currently, only integer and half-integer exponents are allowed for the power operation in expressions and only the square-root operation is implemented besides the four arithmetic operations. Square-root and the four operations achieve correct rounding in the given arbitrary precision.

Usage

It is possible to use the package with Plain (using for example `\input xintexpr.sty`) or with LaTeX (`\usepackage{xintexpr}`).

With LaTeX

```
\usepackage{xint}       % expandable arithmetic with big integers
\usepackage{xintfrac}   % decimal numbers, fractions, floats
\usepackage{xinttools}  % expandable and non expandable loops
\usepackage{xintexpr}   % expressions with infix operators
```

Further packages: `xintbinhex`, `xintgcd`, `xintseries` and `xintcfrac`.

Main dependencies are handled automatically. For example `xintexpr` automatically loads `xinttools` and `xintfrac` (which itself loads `xint`). But the `gcd()`/`lcm()` functions require extra loading of `xintgcd` and hexadecimal input requires `xintbinhex`.

Package `xintcore` is the subset of `xint` providing only the five operations on big integers: `\xintiiAdd`, `\xintiiMul`, ...

The LaTeX package bnumexpr defines a more light-weight parser of arithmetical expressions using big integers, which supports only the four operations, the modulo operation, the power operation, and the factorial. By default it uses the macros from `xintcore` but this can be customized.

With TeX

One does for example:

`\input xintexpr.sty`

The packages may be loaded in any catcode context such that letters, digits, `\` and `%` have their standard catcodes.

`xintcore.sty` and `xinttools.sty` both import `xintkernel.sty` which has the catcode handler and package identifier and defines a few utilities such as `\oodef/\fdef`, `\xint_dothis/\xint_orthat`, or `\xintLength`.

Since `1.3b`, `xintkernel.sty` also provides `\xintUniformDeviate` which is a wrapper of the engine `\pdfuniformdeviate` or `\uniformdeviate` done to guarantee more uniformity of the pseudo-random integers. This is used by `xintexpr.sty` for implementing `random()` and `randrange()` functions.

Installation

Method A: using the package manager of your TeX distribution

`xint` is included in TeXLive (hence also MacTeX) and MikTeX.

There can be a few days of delay between apparition of a new version on CTAN and availability via the distribution package manager.

Method B: manual installation using `xint.tds.zip` and `unzip`

Assumes a GNU/Linux-like system (or Mac OS X).

1. obtain `xint.tds.zip` from CTAN: http://mirror.ctan.org/install/macros/generic/xint.tds.zip

2. cd to the download repertory and issue:

   `unzip xint.tds.zip -d <TEXMF>`

   where <TEXMF> is a suitable TDS-compliant destination repertory. For example, with TeXLive:

   - Linux, standard access rights, hence sudo is needed, installation into the "local" tree:

     ```
     sudo unzip xint.tds.zip -d /usr/local/texlive/texmf-local
     sudo texhash /usr/local/texlive/texmf-local
     ```

   - Mac OS X, installation into user home folder (no sudo needed, and it is recommended to not have a ls-R file there, hence no texhash):

     `unzip xint.tds.zip -d  ~/Library/texmf`

Method C: manual installation using `Makefile` and `xint.dtx`

The Makefile automatizes rebuilding from `xint.dtx` all documentation files as well as `xint.tds.zip`. It is for GNU/Linux-like (inc. Mac OS X) systems, with a teTeX like installation such as TeXLive. The Latexmk and Pandoc softwares are required to build all the documentation.

1. obtain `xint.dtx` and `Makefile` from http://mirror.ctan.org/macros/generic/xint.

2. put them in an otherwise empty working repertory, run `make` or equivalently `make help` for further instructions.

Method D: installation starting with only `xint.dtx`

Run `etex xint.dtx` to extract from `xint.dtx` all macro files as well as auxiliary files needed for building the documentation. Among them there is `Makefile.mk`. If you are on a GNU/Linux-type system, rename the file to `Makefile` and execute `make` on command line for further help. If not, you will need to examine the contents of this file to see the commands needed to produce the documentation with `latexmk` (extraction will have created a configuration file `.latexmkrc`) and `pandoc`. If not using `latexmk`, you will need to execute suitable `makeindex -s xint-gind.ist` calls to produce the indices of macros for inclusion into `sourcexint.pdf`. It is also possible to get `xint.pdf` to include the source code. For this, see the instructions in `xint.tex`.

Finishing the installation in a TDS hierarchy:

- move the style files to `TDS:tex/generic/xint/`

- `xint.dtx` goes to `TDS:source/generic/xint/`

- The documentation (xint.pdf, README.md,...) goes to `TDS:doc/generic/xint/`

Depending on the destination, it may then be necessary to refresh a filename database.

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