Tutorial: using libpari in GP scripts

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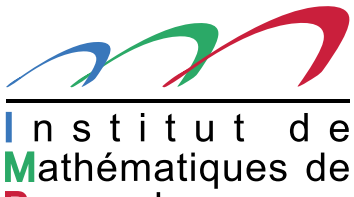
http://pari.math.u-bordeaux.fr/



Looking for the right GP function

E.g. Hensel lifts:

```
users.dvi

???keyword

pari-users@pari.math.u-bordeaux.fr

pari-dev@pari.math.u-bordeaux.fr

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But we can as well inspect what `libpari` provides

```
???keyword@
```

```
libpari.dvi
```

```
??"Hensel lifts"@
```

An example: p-adic square root

```
sqrt(2+O(7^30))

install(Zp_sqrtlift,GGGL)

Zp_sqrtlift(2,3,7,30)
```

How does install(name, code) work ?

- it opens the running `gp` program, as loaded in memory: `dlopen(NULL,)` (exposes all of `libpari`);
- it looks for a symbol matching the name: `dlsym(, name)`, returns the address of some machine code in memory;
- it associates a “prototype” to the symbol (expected arguments and return type), and records this data in the parser table.
- from that point on, a new GP function is available, to call a libpari function as if it had been built-in into the interpreter.

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N.B. We can load symbols from other libraries, and give them arbitrary names in GP

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From a user’s point of view, this can remain black magic. The only difficulty is to provide the correct prototype: it can (mostly) be inferred from the C prototype, as documented in `libpari.dvi`.

Prototypes (simplified)

- First character `i`, `l`, `v` : return type int / long / void. (Default: GEN)
- One letter for each mandatory argument: `G` (GEN), `&` (GEN*), `L` (long), `n` (variable)
- `p` to supply `realprecision`, `P` to supply `seriesprecision`.
- Special constructs for optional arguments and default values:
  - `DG` (optional `GEN`, `NULL` if omitted),
  - `D&` (optional `GEN*`, `NULL` if omitted),
  - `Dn` (optional variable, -1 if omitted),

`GEN Zp_sqrtlift(GEN b, GEN a, GEN p, long e)` $\Longrightarrow$ `GGGL`