POLYNOM

🎯 A library to manipulate polynomials over finite fields.

🔐 Design for cryptographic operations.

🚀 Explore this project on GitHub!

https://github.com/groumage/PolyNom/

TECHNICAL OVERVIEW

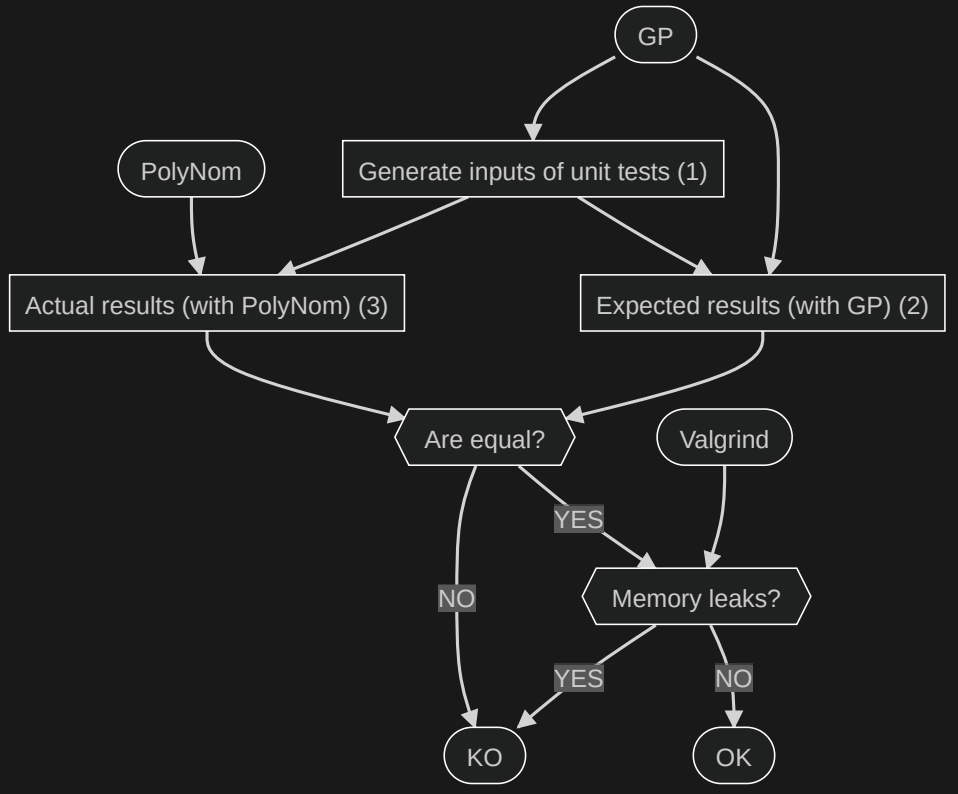
💻 Technology stacks:

- C language
- GMP library
- GP[1]
- Valgrind
- Gcovr

1. An interactive shell providing fast computation functions in number theory.

TEST-DRIVEN DEVELOPMENT

🔎 GP generates random inputs and expected outputs that PolyNom's functions should return.



CODE COVERAGE

🔦 Code coverage of PolyNom is performed Gcovr.

⚙ 76% of lines of codes, 79 % of functions and 82 % of branches are covered.

Code coverage report can be found here (open it in your favorite browser).

DEMONSTRATION

📷 Unit tests execution of usual operations $(512 \leq deg(P_{\text{inputs}}) \leq 2048)$ along with Valgrind.

```
File  Edit  View  Search  Terminal  Help
❯ ./test.sh long-memory
Round 1 of test is running...
Test project /home/guillaume/50-59_Dev/52_C/52.01_Polynom/PolyNom/build
      Start 17: addition_memory
 1/11 Test #17: addition_memory .................   Passed    0.47 sec
      Start 19: substraction_memory
 2/11 Test #19: substraction_memory .............   Passed    0.49 sec
      Start 21: multiplication_memory
 3/11 Test #21: multiplication_memory ...........   Passed    0.46 sec
      Start 23: division_memory
 4/11 Test #23: division_memory .................   Passed    0.51 sec
      Start 25: gcd_memory
 5/11 Test #25: gcd_memory ......................   Passed    0.47 sec
      Start 27: multiplication_fq_memory
 6/11 Test #27: multiplication_fq_memory ........   Passed    0.47 sec
      Start 29: gcd_ext_memory
 7/11 Test #29: gcd_ext_memory ..................   Passed    0.48 sec
      Start 33: irred_generation_long_memory
 8/11 Test #33: irred_generation_long_memory .....   Passed    9.41 sec
      Start 36: irred_check_memory
 9/11 Test #36: irred_check_memory ..............   Passed    0.48 sec
      Start 40: random_prime_long_memory
10/11 Test #40: random_prime_long_memory ........   Passed   53.57 sec
      Start 43: gcd_ext_integer_memory
11/11 Test #43: gcd_ext_integer_memory ...........   Passed    0.45 sec

100% tests passed, 0 tests failed out of 11

Label Time Summary:
long-integer        =  53.57 sec*proc (1 test)
long-irreducible    =   9.41 sec*proc (1 test)
memory              =  67.27 sec*proc (11 tests)
nominal             =  67.27 sec*proc (11 tests)

Total Test time (real) =  67.27 sec
Round 1 of tests succeed
All round tests succeed!

 ~/5/52/5/PolyNom  main !1 ?1 ···· 1m 7s  12:38:12
❯ scrot -u
```

CONCLUSION

 PolyNom manipulates arbitrary long polynomials over finite fields.

⚙ PolyNom's functions are tested with Valgrind.

 A code coverage of PolyNom is performed.

 Checkout PolyNom and its nice documentation!

BONUS: TECHNICAL OVERVIEW

```
typedef struct fp_poly_t
{
    mpz_t index_coeff;
    list_t *coeffs;
} fp_poly_t;
```

$$P(x) = 2 + x^2 + x^3$$

$$P_{\text{index coeff}} = 1011_2 = 11_{10}$$

$$P_{\text{coeffs}} = \{2\} \rightarrow \{1\} \rightarrow \{1\} \rightarrow NULL$$