


# *Computação em Larga Escala*

*General Problems – Algorithmic analysis 3*

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# *Summary*

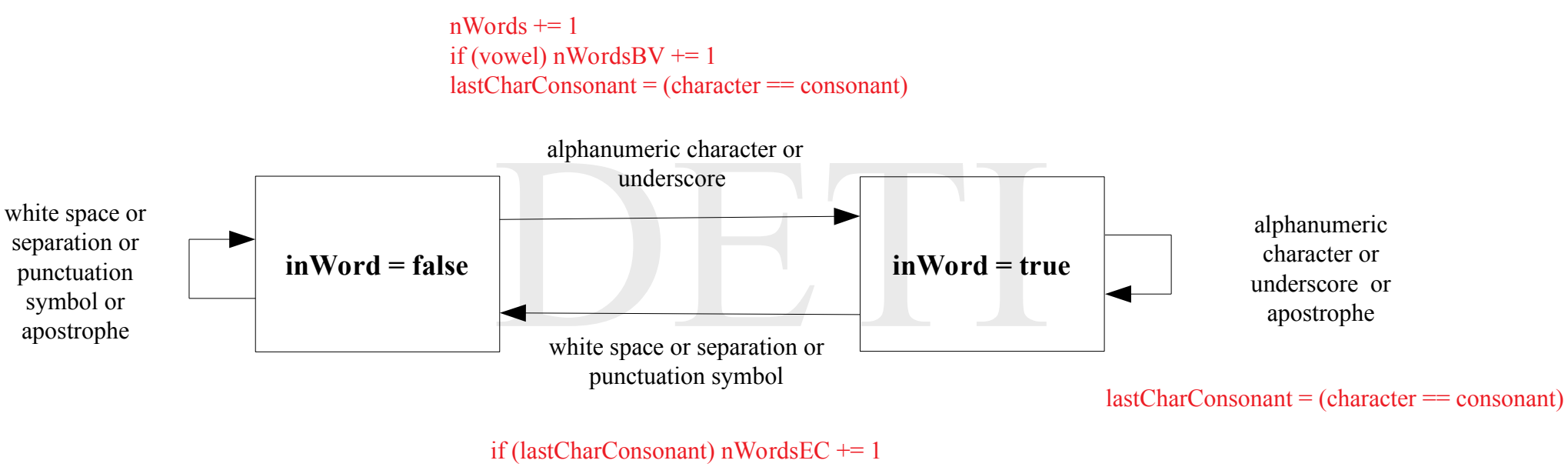
- *Text processing in Portuguese*
  - *Algorithm* (*top-down approach*)
- *Determinant of a square matrix*
  - *Processing results*
- *Measuring execution time*
- *Processing command line*

# *Text processing in Portuguese - 1*

## Algorithm

```
inWord = false;
nWords = nWordsBV = nWordsEC = 0;
while (extractAChar (textFile, UTF8Char) != EOF)
{ processAChar (textFile, inWord, nWords, nWordsBV, nWordsEC));
}
```

# *Text processing in Portuguese - 2*



# *Determinant of a square matrix - 1*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat128_32.bin

Number of matrices to be read = 128
Matrices order = 32

Processing matrix 1
The determinant is 3.242e+00
Processing matrix 2
The determinant is 8.860e-02
Processing matrix 3
The determinant is -6.632e-01
          .  .  .
Processing matrix 51
The determinant is -2.994e-02
Processing matrix 52
The determinant is 2.090e-01
Processing matrix 53
The determinant is -2.069e+00
          .  .  .
Processing matrix 101
The determinant is -1.144e+00
Processing matrix 102
The determinant is 2.096e-01
Processing matrix 103
The determinant is -3.707e-01
          .  .  .
Processing matrix 128
The determinant is 3.855e-01

Elapsed time = 0.000856 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 2*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat128_64.bin

Number of matrices to be read = 128
Matrices order = 64

Processing matrix 1
The determinant is -5.030e+09
Processing matrix 2
The determinant is 1.840e+09
Processing matrix 3
The determinant is -1.038e+09
           .  .  .
Processing matrix 51
The determinant is 2.223e+09
Processing matrix 52
The determinant is -2.777e+08
Processing matrix 53
The determinant is 4.029e+09
           .  .  .
Processing matrix 101
The determinant is -1.399e+09
Processing matrix 102
The determinant is 1.435e+09
Processing matrix 103
The determinant is 9.452e+08
           .  .  .
Processing matrix 128
The determinant is 1.817e+08

Elapsed time = 0.004842 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 3*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat128_128.bin

Number of matrices to be read = 128
Matrices order = 128

Processing matrix 1
The determinant is 1.318e+37
Processing matrix 2
The determinant is 4.756e+38
Processing matrix 3
The determinant is -4.875e+36
          .  .  .
Processing matrix 51
The determinant is -2.083e+37
Processing matrix 52
The determinant is 7.907e+36
Processing matrix 53
The determinant is 2.765e+39
          .  .  .
Processing matrix 101
The determinant is 1.216e+39
Processing matrix 102
The determinant is 2.270e+38
Processing matrix 103
The determinant is -1.119e+37
          .  .  .
Processing matrix 128
The determinant is 5.374e+37

Elapsed time = 0.034026 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 4*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat128_256.bin

Number of matrices to be read = 128
Matrices order = 256

Processing matrix 1
The determinant is 1.566e+113
Processing matrix 2
The determinant is 7.867e+112
Processing matrix 3
The determinant is -2.151e+114
           .  .  .
Processing matrix 51
The determinant is -1.201e+114
Processing matrix 52
The determinant is -3.965e+112
Processing matrix 53
The determinant is 6.430e+115
           .  .  .
Processing matrix 101
The determinant is -1.823e+113
Processing matrix 102
The determinant is -9.705e+114
Processing matrix 103
The determinant is 2.738e+113
           .  .  .
Processing matrix 128
The determinant is 4.511e+115

Elapsed time = 0.299831 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 5*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat512_32.bin

Number of matrices to be read = 512
Matrices order = 32

Processing matrix 1
The determinant is -2.717e-01
Processing matrix 2
The determinant is -5.349e-01
Processing matrix 3
The determinant is 1.897e+00
           .  .  .
Processing matrix 201
The determinant is -5.623e+00
Processing matrix 202
The determinant is -1.629e+00
Processing matrix 203
The determinant is -4.305e-01
           .  .  .
Processing matrix 401
The determinant is -3.114e-01
Processing matrix 402
The determinant is -1.050e+00
Processing matrix 403
The determinant is 4.437e-02
           .  .  .
Processing matrix 512
The determinant is -9.314e+00

Elapsed time = 0.003753 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 6*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat512_64.bin

Number of matrices to be read = 512
Matrices order = 64

Processing matrix 1
The determinant is -4.308e+09
Processing matrix 2
The determinant is -5.106e+08
Processing matrix 3
The determinant is -1.217e+09
          .  .  .
Processing matrix 201
The determinant is 2.003e+09
Processing matrix 202
The determinant is 2.683e+09
Processing matrix 203
The determinant is 5.270e+08
          .  .  .
Processing matrix 401
The determinant is 1.026e+09
Processing matrix 402
The determinant is -1.820e+10
Processing matrix 403
The determinant is 1.063e+08
          .  .  .
Processing matrix 512
The determinant is 1.107e+09

Elapsed time = 0.018448 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 7*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat512_128.bin

Number of matrices to be read = 512
Matrices order = 128

Processing matrix 1
The determinant is 2.138e+37
Processing matrix 2
The determinant is -4.626e+37
Processing matrix 3
The determinant is 1.018e+38
           .  .  .
Processing matrix 201
The determinant is -8.529e+37
Processing matrix 202
The determinant is 1.284e+37
Processing matrix 203
The determinant is -4.538e+36
           .  .  .
Processing matrix 401
The determinant is -1.509e+38
Processing matrix 402
The determinant is 2.289e+39
Processing matrix 403
The determinant is 1.222e+38
           .  .  .
Processing matrix 512
The determinant is -9.349e+37

Elapsed time = 0.154575 s
[ruib@ruib-laptop computeDet]$
```

# *Determinant of a square matrix - 8*

```
[ruib@ruib-laptop computeDet]$ ./computeDet -f mat512_256.bin

Number of matrices to be read = 512
Matrices order = 256

Processing matrix 1
The determinant is -5.475e+113
Processing matrix 2
The determinant is -5.509e+113
Processing matrix 3
The determinant is 5.520e+112
          .  .  .
Processing matrix 201
The determinant is -4.437e+112
Processing matrix 202
The determinant is 1.007e+115
Processing matrix 203
The determinant is 7.508e+113
          .  .  .
Processing matrix 401
The determinant is -6.351e+114
Processing matrix 402
The determinant is -1.525e+114
Processing matrix 403
The determinant is -1.416e+115
          .  .  .
Processing matrix 512
The determinant is 1.467e+114

Elapsed time = 1.170738 s
[ruib@ruib-laptop computeDet]$
```

# *Measuring execution time - 1*

```
#include <time.h>

double t0, t1, t2;                                                    /* time limits */

t2 = 0.0;

while (not all text files been processed)
{
  /* open the text file */

  t0 = ((double) clock ()) / CLOCKS_PER_SEC;

  /* parse its contents */

  t1 = ((double) clock ()) / CLOCKS_PER_SEC;
  t2 += t1 - t0;

  /* close the text file */

  /* print the parsing results */
}

printf ("\nElapsed time = %.6f s\n", t2);
```

# *Measuring execution time - 2*

```
#include <time.h>

double t0, t1, t2;                                                    /* time limits */

t2 = 0.0;

/* open the file and read the number and the order of matrices to be processed */

while (not all matrices been processed)
{ t0 = ((double) clock ()) / CLOCKS_PER_SEC;

  /* read the coefficients and compute its determinant */

  t1 = ((double) clock ()) / CLOCKS_PER_SEC;
  t2 += t1 - t0;

  /* print the value of the determinant */
}

/* close the file */

printf ("\nElapsed time = %.6f s\n", t2);
```

# *Processing command line - 1*

```c
#include <stdio.h>
#include <stdlib.h>
#include <libgen.h>
#include <unistd.h>
#include <string.h>
static void printUsage (char *cmdName);
int main (int argc, char *argv[])
{
  int opt;                                          /* selected option */
  char *fName = "no name";                          /* file name (initialized to "no name" by default) */
  int val = -1;                                     /* numeric value (initialized to -1 by default) */
  opterr = 0;
  do
  { switch ((opt = getopt (argc, argv, "f:n:h")))
    { case 'f': /* file name */
                if (optarg[0] == '-')
                  { fprintf (stderr, "%s: file name is missing\n", basename (argv[0]));
                    printUsage (basename (argv[0]));
                    return EXIT_FAILURE;
                  }
                fName = optarg;
                break;
      case 'n': /* numeric argument */
                if (atoi (optarg) <= 0)
                   { fprintf (stderr, "%s: non positive number\n", basename (argv[0]));
                     printUsage (basename (argv[0]));
                     return EXIT_FAILURE;
                   }
                val = (int) atoi (optarg);
                break;
      case 'h': /* help mode */
                printUsage (basename (argv[0]));
                return EXIT_SUCCESS;
      case '?': /* invalid option */
                fprintf (stderr, "%s: invalid option\n", basename (argv[0]));
                printUsage (basename (argv[0]));
                return EXIT_FAILURE;
      case -1:  break;
    }
  } while (opt != -1);
```

# *Processing command line - 2*

```
  if (argc == 1)
     { fprintf (stderr, "%s: invalid format\n", basename (argv[0]));
       printUsage (basename (argv[0]));
       return EXIT_FAILURE;
     }
  int o;                                        /* counting variable */
  printf ("File name = %s\n", fName);
  printf ("Numeric value = %d\n", val);
  for (o = 0; o < argc; o++)
    printf ("Word %d = %s\n", o, argv[o]);
  return EXIT_SUCCESS;
} /* end of main */

static void printUsage (char *cmdName)
{
  fprintf (stderr, "\nSynopsis: %s OPTIONS [filename / positive number]\n"
           "  OPTIONS:\n"
           "  -h      --- print this help\n"
           "  -f      --- filename\n"
           "  -n      --- positive number\n", cmdName);
}
```