Výstupní protokol – profiling kalkulačky

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Obsah:

Systém a použité nástroje, měřené hodnoty

Systém:

Profiling byl spouštěn na systému MSI model GF75 Thin 10SCXR typu x64-based PC s procesorem Intel® Core™ i5-10300H CPU @ 2.50GHz, 2496 Mhz, 4 jádra. Program byl spuštěn na serveru www.merlin.fit.vutbr.cz.

Nástroje:

Jako nástroj profilingu byl použit gprof. Graf byl vytvořen v gprof2dot.

Měřené hodnoty:

Jako vstupní data byla použita pseudonáhodná čísla v rozsahu <1;100>. Jejich celkový počet byl 10, 1000, 10000000 pro jednotlivé měření.

Flat profile pro vstup 10 čísel

```
Flat profile:


Each sample counts as 0.01 seconds.
 no time accumulated


  %   cumulative   self              self     total
 time   seconds   seconds    calls  Ts/call  Ts/call  name
 0.00     0.00     0.00       71     0.00     0.00   removeTrailingZeros
 0.00     0.00     0.00       39     0.00     0.00   convertToString
 0.00     0.00     0.00       39     0.00     0.00   remove_substring
 0.00     0.00     0.00       30     0.00     0.00   convertLongDoubleToString
 0.00     0.00     0.00       20     0.00     0.00   op_add
 0.00     0.00     0.00       14     0.00     0.00   op_mul
 0.00     0.00     0.00        2     0.00     0.00   convertUlToString
 0.00     0.00     0.00        2     0.00     0.00   op_div
 0.00     0.00     0.00        2     0.00     0.00   op_sub
 0.00     0.00     0.00        1     0.00     0.00   arithmetic_mean
 0.00     0.00     0.00        1     0.00     0.00   handleInput
 0.00     0.00     0.00        1     0.00     0.00   join_sqrt
 0.00     0.00     0.00        1     0.00     0.00   left_part
 0.00     0.00     0.00        1     0.00     0.00   op_root
 0.00     0.00     0.00        1     0.00     0.00   right_part


  %          the percentage of the total running time of the
 time        program used by this function.


cumulative  a running sum of the number of seconds accounted
 seconds     for by this function and those listed above it.


 self        the number of seconds accounted for by this
seconds      function alone.  This is the major sort for this
             listing.


calls        the number of times this function was invoked, if
             this function is profiled, else blank.


 self        the average number of milliseconds spent in this
ms/call      function per call, if this function is profiled,
             else blank.
```

```
 total     the average number of milliseconds spent in this
ms/call    function and its descendents per call, if this
           function is profiled, else blank.


name       the name of the function.  This is the minor sort
           for this listing. The index shows the location of
           the function in the gprof listing. If the index is
           in parenthesis it shows where it would appear in
           the gprof listing if it were to be printed.
^L
```

Flat profile pro vstup 1000 čísel

```
Flat profile:


Each sample counts as 0.01 seconds.
  %   cumulative   self              self    total
 time   seconds   seconds    calls  Ts/call  Ts/call  name
 50.00      0.01      0.01                             __gmpn_divrem_1
 50.00      0.02      0.01                             __gmpn_invert_limb
  0.00      0.02      0.00     6012     0.00     0.00  removeTrailingZeros
  0.00      0.02      0.00     3009     0.00     0.00  convertToString
  0.00      0.02      0.00     3009     0.00     0.00  remove_substring
  0.00      0.02      0.00     3000     0.00     0.00  convertLongDoubleToString
  0.00      0.02      0.00     2000     0.00     0.00  op_add
  0.00      0.02      0.00     1004     0.00     0.00  op_mul
  0.00      0.02      0.00        2     0.00     0.00  convertUlToString
  0.00      0.02      0.00        2     0.00     0.00  op_div
  0.00      0.02      0.00        2     0.00     0.00  op_sub
  0.00      0.02      0.00        1     0.00     0.00  arithmetic_mean
  0.00      0.02      0.00        1     0.00     0.00  handleInput
  0.00      0.02      0.00        1     0.00     0.00  join_sqrt
  0.00      0.02      0.00        1     0.00     0.00  left_part
  0.00      0.02      0.00        1     0.00     0.00  op_root
  0.00      0.02      0.00        1     0.00     0.00  right_part


 %         the percentage of the total running time of the
time       program used by this function.

cumulative a running sum of the number of seconds accounted
 seconds   for by this function and those listed above it.

 self      the number of seconds accounted for by this
seconds    function alone.  This is the major sort for this
           listing.

calls      the number of times this function was invoked, if
           this function is profiled, else blank.

 self      the average number of milliseconds spent in this
ms/call    function per call, if this function is profiled,
           else blank.
```

```
 total      the average number of milliseconds spent in this
ms/call    function and its descendents per call, if this
           function is profiled, else blank.


name       the name of the function.  This is the minor sort
           for this listing. The index shows the location of
           the function in the gprof listing. If the index is
           in parenthesis it shows where it would appear in
           the gprof listing if it were to be printed.
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```

Flat profile pro vstup 1.000.000 čísel

```
Flat profile:

Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls  ms/call  ms/call  name
 73.43     0.54      0.54  5298760     0.00     0.00  removeTrailingZeros
 10.98     0.62      0.08  3000000     0.00     0.00  convertLongDoubleToString
  5.49     0.66      0.04        1    40.08   260.52  arithmetic_mean
  2.75     0.68      0.02  2000000     0.00     0.00  op_add
  2.75     0.70      0.02        1    20.04   460.91  right_part
  1.37     0.71      0.01  3000009     0.00     0.00  convertToString
  1.37     0.72      0.01  1000004     0.00     0.00  op_mul
  1.37     0.73      0.01        1    10.02    10.02  handleInput
  0.69     0.73      0.01  3000009     0.00     0.00  remove_substring
  0.00     0.73      0.00        2     0.00     0.00  convertUlToString
  0.00     0.73      0.00        2     0.00     0.00  op_div
  0.00     0.73      0.00        2     0.00     0.00  op_sub
  0.00     0.73      0.00        1     0.00     0.00  join_sqrt
  0.00     0.73      0.00        1     0.00     0.00  left_part
  0.00     0.73      0.00        1     0.00     0.00  op_root


 %         the percentage of the total running time of the
time        program used by this function.


cumulative a running sum of the number of seconds accounted
 seconds    for by this function and those listed above it.


 self       the number of seconds accounted for by this
seconds     function alone.  This is the major sort for this
            listing.


calls       the number of times this function was invoked, if
            this function is profiled, else blank.


 self       the average number of milliseconds spent in this
ms/call     function per call, if this function is profiled,
            else blank.


 total      the average number of milliseconds spent in this
ms/call     function and its descendents per call, if this
```
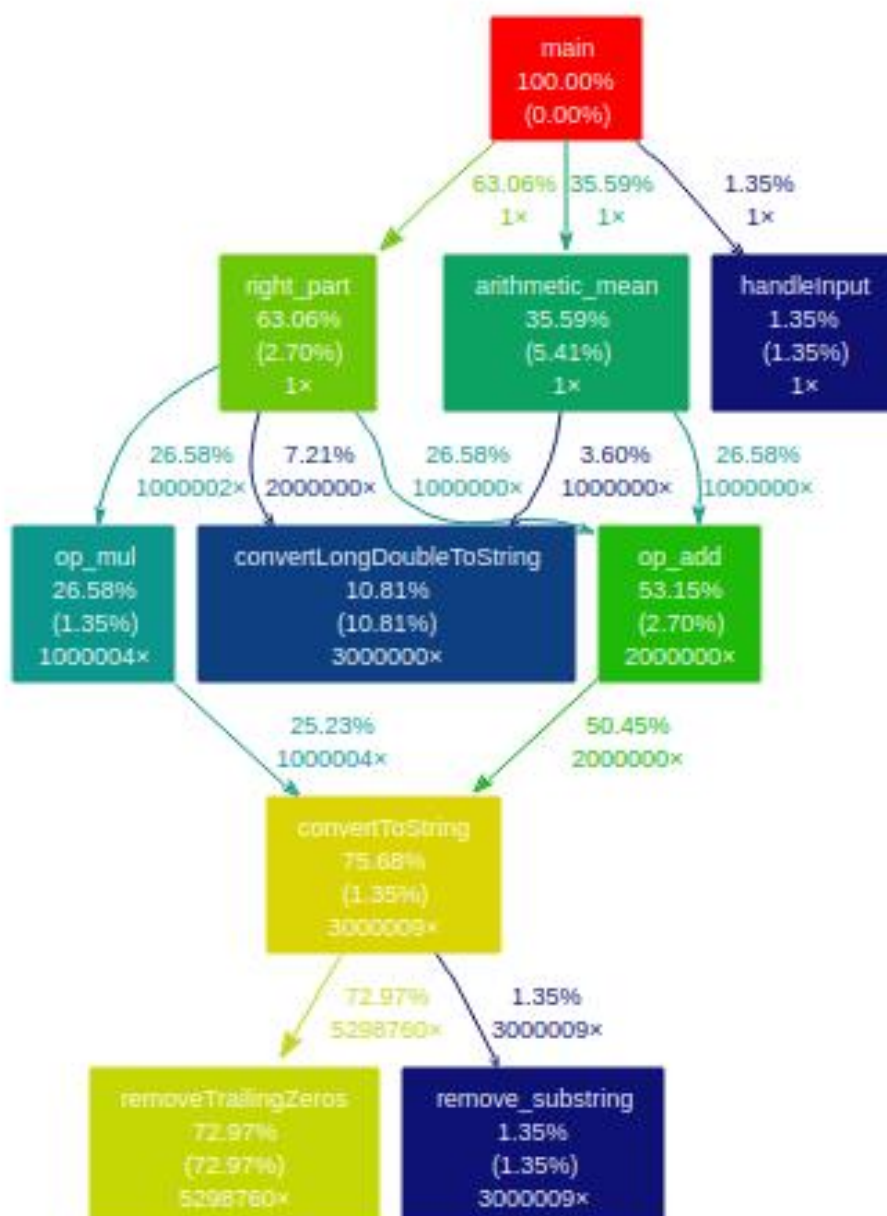
```
           function is profiled, else blank.


name       the name of the function.  This is the minor sort
           for this listing. The index shows the location of
           the function in the gprof listing. If the index is
           in parenthesis it shows where it would appear in
           the gprof listing if it were to be printed.
```

Graf pro vstup 1.000.000 čísel

Závěr

Z naměřených dat vyplývá, že nejvíce byly volány funkce pro úpravu čísel a dat.
Funkce matematické knihovny byly volány na základě počtu operací v profilingovém programu. Můžeme vidět, že se nejvíce používalo sčítání a násobení.

Pozitivní informací je, že žádná funkce nezabírá nadměrné množství času, avšak v případě výskytu většího počtu naměřených hodnot by bylo vhodné optimalizovat funkce pro úpravy dat, zejména pak funkci removeTrailingZeros, která v případě spuštění programu pro milion vstupů trvá nejvíce času. (Dokonce sedmkrát více než druhá časově nejnáročnější funkce).

Graf nám potvrzuje předešlé výsledky měření. Program se nejvíce zdržuje v částech, kde dochází ke konverzi datových typů a v matematických knihovnách se nejvíce zdržuje pouze u používaných operacích v závislosti na počtu vstupů.
V samotných funkcích profilingu se program zdržuje minimálně.