

Solution Labo #1 : Nombre d'inversions avec parallélisme récuratif

```
#  
# Methode sequentielle recursive.  
#  
def nb_inversions_rec( seuil )  
  nb_inversions_rec_ij( 0, size-1, seuil )  
end  
  
def nb_inversions_rec_ij( i, j, seuil )  
  return nb_inversions_seq_ij(i, j) if j - i <= seuil  
  
  m = (i + j) / 2  
  
  nb1 = nb_inversions_rec_ij( i, m, seuil )  
  nb2 = nb_inversions_rec_ij( m, j, seuil )  
  
  nb1 + nb2  
end  
  
#
```

```

#
# Methode parallele recursive avec pcall.
#
def nb_inversions_pcall( seuil )
  nb_inversions_pcall_ij( 0, size-1, seuil )
end

def nb_inversions_pcall_ij( i, j, seuil )
  return nb_inversions_seq_ij(i, j) if j - i <= seuil

  m = (i + j) / 2

  nb1 = nb2 = nil
  PRuby.pcall( -> { nb1 = nb_inversions_pcall_ij(i, m, seuil) },
              -> { nb2 = nb_inversions_pcall_ij(m, j, seuil) } )

  nb1 + nb2
end

#

```

```

#
# Methode parallele recursive avec un seul future.
#
def nb_inversions_future( seuil )
  nb_inversions_future_ij( 0, size-1, seuil )
end

def nb_inversions_future_ij( i, j, seuil )
  return nb_inversions_seq_ij(i, j) if j - i <= seuil

  m = (i + j) / 2

  nb1 = PRuby.future { nb_inversions_future_ij( i, m, seuil ) }
  nb2 = nb_inversions_future_ij( m, j, seuil )

  nb1.value + nb2
end

#

```

```

#
# Methode diviser pour regner "trichotomique"
# => decomposition en trois sous-problemes.
#
def nb_inversions_rec3( seuil )
  nb_inversions_rec_ij( 0, size-1, seuil )
end

def nb_inversions_rec3_ij( i, j, seuil )
  nb_elements = j - i + 1
  return nb_inversions_seq_ij(i, j) if nb_elements <= [seuil, 3].max

  # On a necessairement 3 elements ou plus!
  i2 = i + nb_elements / 3
  i3 = i + 2 * nb_elements / 3

  nb1 = PRuby.future { nb_inversions_rec3_ij(i, i2-1, seuil) }
  nb2 = PRuby.future { nb_inversions_rec3_ij(i2, i3-1, seuil) }
  nb3 = nb_inversions_rec_ij( i3, j, seuil )

  nb_frontieres = nb_inversions_seq_ij(i2-1,i2) + nb_inversions_seq_ij(i3-1,i3)
  nb1.value + nb2.value + nb3 + nb_frontieres
end
end

```

Temps d'exécution obtenus avec nb_inversions_bm.rb

Note : Moyenne de trois exécutions

Temps sur japet

TAILLE=1000 ruby nb_inversions_bm.rb

| | | | | | |
|--------|-------|--------|---|-------|------|
| [1000] | (1) | seq: | : | 0.001 | 1.00 |
| [1000] | (1) | rec | : | 0.010 | 0.13 |
| [1000] | (10) | rec | : | 0.002 | 0.80 |
| [1000] | (100) | rec | : | 0.001 | 1.33 |
| [1000] | (500) | rec | : | 0.001 | 2.00 |
| [1000] | (1) | future | : | 0.477 | 0.00 |
| [1000] | (10) | future | : | 0.038 | 0.04 |
| [1000] | (100) | future | : | 0.004 | 0.36 |
| [1000] | (500) | future | : | 0.001 | 2.00 |
| [1000] | (1) | pcall | : | 0.744 | 0.00 |
| [1000] | (10) | pcall | : | 0.072 | 0.02 |
| [1000] | (100) | pcall | : | 0.006 | 0.24 |
| [1000] | (500) | pcall | : | 0.001 | 1.33 |

TAILLE=5000 ruby nb_inversions_bm.rb

| | | | | | |
|--------|-------|--------|---|-------|------|
| [5000] | (1) | seq: | : | 0.003 | 1.00 |
| [5000] | (1) | rec | : | 0.024 | 0.14 |
| [5000] | (10) | rec | : | 0.004 | 0.91 |
| [5000] | (100) | rec | : | 0.002 | 1.43 |
| [5000] | (500) | rec | : | 0.002 | 2.00 |
| [5000] | (1) | future | : | 1.850 | 0.00 |
| [5000] | (10) | future | : | 0.139 | 0.02 |
| [5000] | (100) | future | : | 0.015 | 0.22 |
| [5000] | (500) | future | : | 0.004 | 0.83 |
| [5000] | (1) | pcall | : | 4.114 | 0.00 |
| [5000] | (10) | pcall | : | 0.369 | 0.01 |
| [5000] | (100) | pcall | : | 0.031 | 0.11 |
| [5000] | (500) | pcall | : | 0.007 | 0.45 |

TAILLE=10000 ruby nb_inversions_bm.rb

| | | | | | |
|---------|-------|--------|---|-------|------|
| [10000] | (1) | seq: | : | 0.006 | 1.00 |
| [10000] | (1) | rec | : | 0.029 | 0.21 |
| [10000] | (10) | rec | : | 0.004 | 1.38 |
| [10000] | (100) | rec | : | 0.003 | 1.80 |
| [10000] | (500) | rec | : | 0.003 | 2.00 |
| [10000] | (1) | future | : | 3.798 | 0.00 |
| [10000] | (10) | future | : | 0.365 | 0.02 |
| [10000] | (100) | future | : | 0.031 | 0.19 |
| [10000] | (500) | future | : | 0.008 | 0.78 |

NoMethodError: undefined method '+' for nil:NilClass

nb_inversions_pcall_ij at /home/tremblay_gu/INF5171/Programmes/Ruby/Inversions

nb_inversions_pcall_ij at /home/tremblay_gu/INF5171/Programmes/Ruby/Inversions

make: *** [bm] Erreur 1

Temps sur ma machine Linux

TAILLE=1000 ruby nb_inversions_bm.rb

| | | | | | |
|--------|-------|--------|---|-------|------|
| [1000] | (1) | seq: | : | 0.003 | 1.00 |
| [1000] | (1) | rec | : | 0.014 | 0.19 |
| [1000] | (10) | rec | : | 0.002 | 1.14 |
| [1000] | (100) | rec | : | 0.001 | 4.00 |
| [1000] | (500) | rec | : | 0.000 | 8.00 |
| [1000] | (1) | future | : | 0.118 | 0.02 |
| [1000] | (10) | future | : | 0.011 | 0.24 |
| [1000] | (100) | future | : | 0.001 | 2.00 |
| [1000] | (500) | future | : | 0.000 | 8.00 |
| [1000] | (1) | pcall | : | 0.270 | 0.01 |
| [1000] | (10) | pcall | : | 0.018 | 0.15 |
| [1000] | (100) | pcall | : | 0.001 | 2.00 |
| [1000] | (500) | pcall | : | 0.000 | Inf |

TAILLE=5000 ruby nb_inversions_bm.rb

| | | | | | |
|--------|-------|--------|---|-------|------|
| [5000] | (1) | seq: | : | 0.002 | 1.00 |
| [5000] | (1) | rec | : | 0.015 | 0.11 |
| [5000] | (10) | rec | : | 0.001 | 1.25 |
| [5000] | (100) | rec | : | 0.001 | 2.50 |
| [5000] | (500) | rec | : | 0.001 | 2.50 |
| [5000] | (1) | future | : | 0.484 | 0.00 |
| [5000] | (10) | future | : | 0.018 | 0.09 |
| [5000] | (100) | future | : | 0.002 | 0.83 |
| [5000] | (500) | future | : | 0.000 | 5.00 |
| [5000] | (1) | pcall | : | 0.790 | 0.00 |
| [5000] | (10) | pcall | : | 0.040 | 0.04 |
| [5000] | (100) | pcall | : | 0.005 | 0.33 |
| [5000] | (500) | pcall | : | 0.001 | 1.25 |

TAILLE=10000 ruby nb_inversions_bm.rb

| | | | | | |
|---------|-------|--------|---|-------|------|
| [10000] | (1) | seq: | : | 0.008 | 1.00 |
| [10000] | (1) | rec | : | 0.018 | 0.42 |
| [10000] | (10) | rec | : | 0.002 | 3.29 |
| [10000] | (100) | rec | : | 0.002 | 3.83 |
| [10000] | (500) | rec | : | 0.002 | 3.83 |
| [10000] | (1) | future | : | 0.714 | 0.01 |
| [10000] | (10) | future | : | 0.062 | 0.12 |
| [10000] | (100) | future | : | 0.005 | 1.64 |
| [10000] | (500) | future | : | 0.001 | 5.75 |

ThreadError: unable to create new native thread

initialize at org/jruby/RubyThread.java:441

new at org/jruby/RubyThread.java:390

pcall_thread at /home/tremblay_g/.rvm/gems/jruby-1.7.25/gems/pruby-C

each_index at org/jruby/RubyArray.java:1672

pcall_thread at /home/tremblay_g/.rvm/gems/jruby-1.7.25/gems/pruby-C

pcall at /home/tremblay_g/.rvm/gems/jruby-1.7.25/gems/pruby-C

nb_inversions_pcall_ij at /home/tremblay_g/INF5171/Programmes/Ruby/Inversions/

nb_inversions_pcall_ij at /home/tremblay_g/INF5171/Programmes/Ruby/Inversions/

make: *** [bm] Erreur 1