Timings of common tasks using the **data.table** package in R

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(A later revision may be available on the homepage)

* WORK IN PROGRESS *

This document contains a series of tests, followed by a summary table of various timings and comparisons. Please go straight to the summary table first <here> in which each row has a link back to the test.

This document is reproducible. Simply run the .Rnw file yourself in your environment to confirm the results. Also see ?vignette, which says that edit(vignette("datatable-timings")) will extract the code from this document so you can easily work with it.

The .Rnw included in the package has N=10,000,000. This is a small number so that 'R CMD build' completes in a reasonable time (about 5 minutes). We don't want the nightly builds on R-Forge and CRAN to slow down just to run long timing comparisons. We have increased this to N=100,000,000 ourselves, and included the output on the datatable homepage (<link>).

Contents

1 Timing tests **1**
1.1 Extraction 1
1.2 Grouping 2
1.3 Test 3 3
1.4 Test 4 3
1.5 Test 5 3

2 Summary table **3**

1 Timing tests

1.1 Extraction

This is a repeat of the test in section 1 of the Introduction vignette. The syntax is explained there. This demonstrates the large difference in speed between vector scans and binary search. Therefore, please avoid using `==` in the `i` expression.

```
> n = ceiling(1e7/26^2)   # 10 million rows
> DF = data.frame(x=rep(LETTERS,each=26*n),
+                 y=rep(letters,each=n),
+                 v=rnorm(n*26^2))
> DT = data.table(DF,key="x,y")
> tables()

     NAME       NROW  MB COLS  KEY
[1,] DT   10,000,068 153 x,y,v x,y
Total: 153MB

> tt=system.time(ans1 <- DF[DF$x=="R" & DF$y=="h",]); tt
```

```
   user  system elapsed
 12.497   0.908  13.444

> head(ans1)

        x y          v
6642058 R h  1.2857793
6642059 R h  0.7092737
6642060 R h  0.7488496
6642061 R h -0.1196093
6642062 R h  0.8859408
6642063 R h  0.3829447

> dim(ans1)

[1] 14793     3

> ss=system.time(ans2 <- DT[J("R","h")]); ss

   user  system elapsed
  0.024   0.000   0.023

> head(ans2)

     x y          v
[1,] R h  1.2857793
[2,] R h  0.7092737
[3,] R h  0.7488496
[4,] R h -0.1196093
[5,] R h  0.8859408
[6,] R h  0.3829447

> dim(ans2)

[1] 14793     3

> identical(ans1$v,ans2$v)

[1] TRUE
```

1.2 Grouping

This is a repeat of the test in section 2 of the Introduction vignette. The syntax is explained there.

```
> ttt=system.time(ans1 <- tapply(DF$v,DF$x,sum)); ttt

   user  system elapsed
 16.605   0.981  17.621

> head(ans1)

         A          B          C          D          E          F
 -177.1773 -1287.0515   515.0785  -185.6328  -278.5627  -126.5583

> sss=system.time(ans2 <- DT[,sum(v),by=x]); sss

   user  system elapsed
  0.468   0.164   0.630

> head(ans2)
```

```
     x         V1
[1,] A  -177.1773
[2,] B -1287.0515
[3,] C   515.0785
[4,] D  -185.6328
[5,] E  -278.5627
[6,] F  -126.5583
```

```
> identical(as.vector(ans1), ans2$V1)
```

```
[1] TRUE
```

1.3 Test 3

1.4 Test 4

1.5 Test 5

2 Summary table

```
> ans
```

```
         base data.table times faster
==     13.444      0.023          584
tapply 17.621      0.630           27
```

```
> toLatex(sessionInfo())
```

- R version 2.14.0 (2011-10-31), i686-pc-linux-gnu
- Locale: LC_CTYPE=en_GB.UTF-8, LC_NUMERIC=C, LC_TIME=en_GB.UTF-8, LC_COLLATE=en_GB.UTF-8, LC_MONETARY=en_GB.UTF-8, LC_MESSAGES=en_GB.UTF-8, LC_PAPER=C, LC_NAME=C, LC_ADDRESS=C, LC_TELEPHONE=C, LC_MEASUREMENT=en_GB.UTF-8, LC_IDENTIFICATION=C
- Base packages: base, datasets, graphics, grDevices, methods, stats, utils
- Other packages: data.table˜1.7.2
- Loaded via a namespace (and not attached): tools˜2.14.0