Proof of Concept

CorporaCoCo v1.0-2 (2017-03-31)

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Fetch the ordered tokens for 'Great Expectations' and 'A Tale of Two Cities' novels from the CLiC API.

```
library(jsonlite)
get_book_tokens <- function(shortname) {
    base_uri <- 'http://clic.bham.ac.uk/api'
    json <- fromJSON(paste0(base_uri, "/subset?corpora=", shortname))
    tokens <- tolower( unlist( sapply(json$data, function(x) {
        head(x[[1]], -1)[as.integer(tail(x[[1]], 1)[[1]])+1]
    }) ) )
}
GE <- get_book_tokens('GE')
TTC <- get_book_tokens('TTC')
```

Load the `CorporaCoCo` package.

```
library(CorporaCoCo)
```

Choose the set of nodes.

```
nodes <- c('back', 'eye', 'eyes', 'forehead', 'hand', 'hands', 'head', 'shoulder')
```

First we want to check that there are no significant results under the null. We create two corpora from alternate chunks of 1000 tokens of the two novels and check that there are no significant co-occurrence differences between our two sets of chunks.

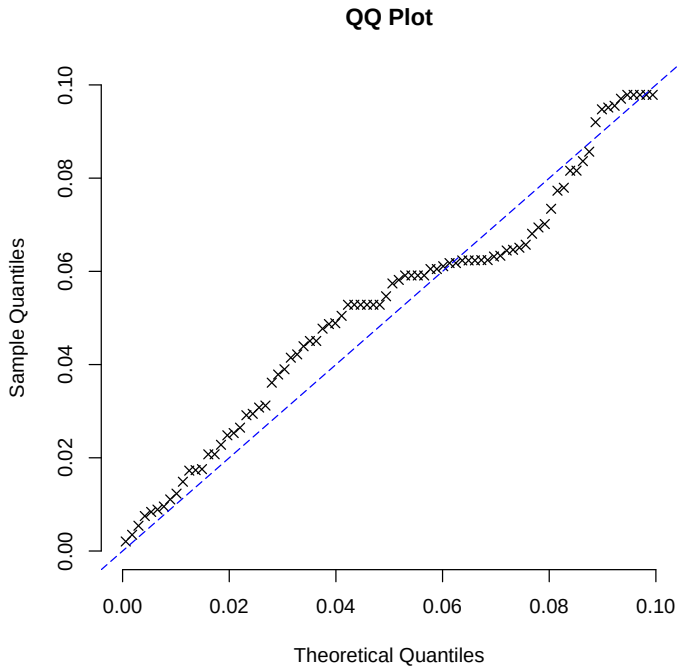
```
chunks <- split(c(GE, TTC), ceiling(seq_along(c(GE, TTC)) / 1000))
corpus_a <- unlist( chunks[seq(1, length(chunks), 2)] )
corpus_b <- unlist( chunks[seq(2, length(chunks), 2)] )
corpus_a_c <- surface(corpus_a, span = '5LR')
corpus_b_c <- surface(corpus_b, span = '5LR')
results <- coco(corpus_a_c, corpus_b_c, nodes = nodes, fdr = 0.01)
results
```

```
Empty data.table (0 rows) of 11 cols: x,y,H_A,M_A,H_B,M_B...
```

This gives us the opportunity to check an assumption of FDR that the p-values are uniformly distributed.

```
results_all <- coco(corpus_a_c, corpus_b_c, nodes = nodes, fdr = 1.0)
test_p_values <- results_all$p_value[results_all$p_value <= 0.1]
```

```
plot(
    qunif(ppoints(test_p_values), min = 0, max = 0.1),
    sort(test_p_values),
    bty = 'n', pch = 4, xlim = c(0.0, 0.1), ylim = c(0.0, 0.1),
    main = "QQ Plot", xlab = "Theoretical Quantiles", ylab = "Sample Quantiles"
)
abline(a = 0, b = 1, col = 'blue', lty = 5)
```



Next we check that if we make some changes to one of our corpora that the method can spot them. Let us change about 90% of the '*my*' tokens to '*CHIMERA*' tokens in `corpus_a` and confirm that the method notices

```
corpus_a_mod <- corpus_a
mys <- which(corpus_a_mod == 'my')
corpus_a_mod[sample(mys, floor(length(mys)*0.9))] <- 'CHIMERA'
corpus_a_mod_c <- surface(corpus_a_mod, span = '5LR')
results <- coco(corpus_a_mod_c, corpus_b_c, nodes = nodes, fdr = 0.01)
results
```

```
          x       y H_A  M_A H_B  M_B effect_size CI_lower  CI_upper      p_value   p_adjusted
1:     eyes CHIMERA  28 1622   0 1790        -Inf     -Inf -2.966573 1.032080e-09 9.577701e-07
2:     eyes      my   3 1647  30 1760    3.225390 1.536255  5.586519 3.600144e-06 1.670467e-03
3:     hand CHIMERA  45 2495   0 2580        -Inf     -Inf -3.594430 1.638018e-14 1.870617e-11
4:     hand      my   2 2538  51 2529    4.677098 2.747446  7.756642 2.707222e-13 1.545824e-10
5:    hands CHIMERA  24 1336   0 1590        -Inf     -Inf -2.836258 7.608477e-09 6.307427e-06
6:     head CHIMERA  36 1944   0 1970        -Inf     -Inf -3.228013 2.487920e-11 2.612316e-08
7: shoulder CHIMERA  16  354   0  420        -Inf     -Inf -2.178354 4.495079e-06 1.240642e-03
```

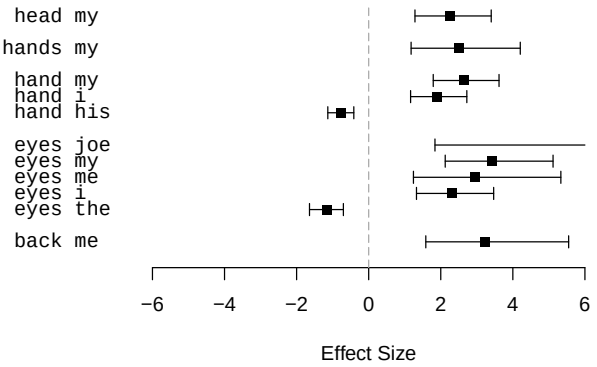
Next a more realistic example (and the reason we chose that set of `nodes`). Here we check that the results indicate the different narrative voice, third and first person, used in the two novels; the body part nouns are expected to be found in suspensions (Mahlberg, 2013).

```
results <- surface_coco(TTC, GE, span = '5LR', nodes = nodes, fdr = 0.01)
results
```

```
        x   y H_A  M_A H_B  M_B effect_size  CI_lower   CI_upper      p_value   p_adjusted
 1:  back  me   3 1337  49 2341    3.221181  1.584866  5.5489805 5.440975e-07 5.283187e-04
 2:  eyes   i  10 1640  53 1737    2.322489  1.326370  3.4680980 1.290817e-07 5.963576e-05
 3:  eyes joe   0 1650  16 1774         Inf  1.839353        Inf 3.552572e-05 6.691836e-03
 4:  eyes  me   3 1647  25 1765    2.958423  1.241832  5.3326117 3.621123e-05 6.691836e-03
 5:  eyes  my   5 1645  57 1733    3.434699  2.123620  5.1159658 9.752564e-12 9.011369e-09
 6:  eyes the 123 1527  62 1728   -1.166398 -1.642460 -0.7024399 2.098712e-07 6.464034e-05
 7:  hand his 176 2294 114 2536   -0.771065 -1.133959 -0.4126876 1.250677e-05 4.744234e-03
 8:  hand   i  19 2451  75 2575    1.909259  1.162857  2.7232409 1.629910e-08 9.274188e-06
 9:  hand  my  13 2457  85 2565    2.646457  1.791317  3.6168202 1.860637e-13 2.117405e-10
10: hands  my   5 1125  45 1775    2.511311  1.177037  4.2063750 1.127123e-05 9.321308e-03
11:  head  my  10 1710  61 2169    2.265311  1.284027  3.3998354 1.607393e-07 1.689370e-04
```

and plot of the results (TTC is on the left)

```
plot(results)
```

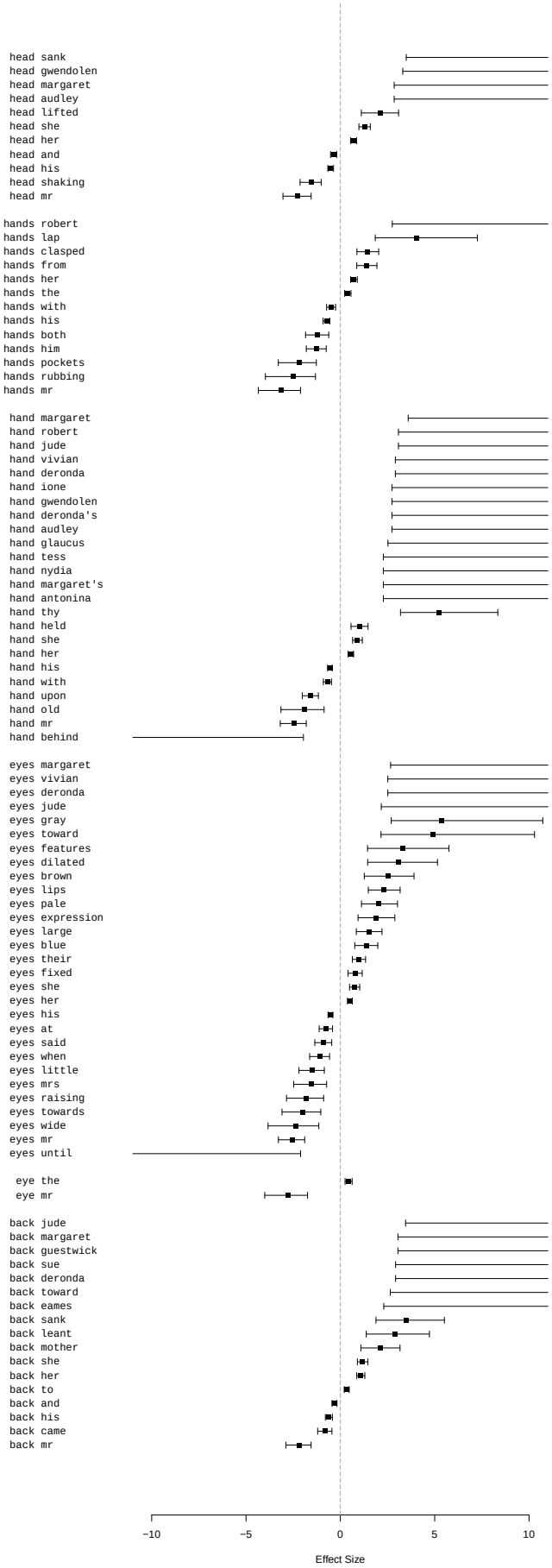


Finally we compare all of Dickens' novels against a set of 19th century novels to check if we can reproduce the observations from Mahlberg (2013) about Dickensian body language patterns. Practically we see this in terms such as *rubbing* co-occurring more frequently with *hands* in Dickens than the other 19th century novels.

```
DICKENS <- get_book_tokens('dickens')
NCNB <- get_book_tokens('ntc')
results <- surface_coco(DICKENS, NCNB, span = '5LR', nodes = nodes, fdr = 0.01)
```

Here is a plot of the results; Dickens is on the left.

```
plot(results)
```


head sank
head gwendolen
head margaret
head audley
head lifted
head she
head her
head and
head his
head shaking
head mr
hands robert
hands lap
hands clasped
hands from
hands her
hands the
hands with
hands his
hands both
hands him
hands pockets
hands rubbing
hands mr
hand margaret
hand robert
hand jude
hand vivian
hand deronda
hand ione
hand gwendolen
hand deronda's
hand audley
hand glaucus
hand tess
hand nydia
hand margaret's
hand antonina
hand thy
hand held
hand she
hand her
hand his
hand with
hand upon
hand old
hand mr
hand behind
eyes margaret
eyes vivian
eyes deronda
eyes jude
eyes gray
eyes toward
eyes features
eyes dilated
eyes brown
eyes lips
eyes pale
eyes expression
eyes large
eyes blue
eyes their
eyes fixed
eyes she
eyes her
eyes his
eyes at
eyes said
eyes when
eyes little
eyes mrs
eyes raising
eyes towards
eyes wide
eyes mr
eyes until
eye the
eye mr
back jude
back margaret
back guestwick
back sue
back deronda
back toward
back eames
back sank
back leant
back mother
back she
back her
back to
back and
back his
back came
back mr
−10
−5
0
5
10
Effect Size

References

Mahlberg, M. (2013). *Corpus Stylistics and Dickens's Fiction*. London: Routledge.