Script to calculate power by simulation for the Farewell and Herzberg example

Initialize

```
library(knitr)
#knitr::spin("AltRCpower.r")
library(dae)
packageVersion("dae")
```

```
## [1] '3.1.38'
```

```
library(asreml)
packageVersion("asreml")
```

```
## [1] '4.1.0.130'
```

```
library(asremlPlus)
packageVersion("asremlPlus")
```

```
## [1] '4.2.32'
```

```
library(parallel)
library(foreach)
library(doParallel)
options(width = 95)

source("globalPower.r")
asreml.options(ai.sing = TRUE)
#nsimul <- 5
```

Load the design

```
load("AltRowColDesign.RData")
```

Add factors for heterogeneous variances

```
ph2.lay <- within(ph2.lay,
                  {
                    MotionsExpress <- fac.combine(list(Motions, Expressiveness),
                                                  combine.levels = TRUE)
                    WMotionsExpress <- fac.nested(MotionsExpress)
                  })
ph2.lay <- with(ph2.lay, ph2.lay[order(MotionsExpress, WMotionsExpress), ])
n <- nrow(ph2.lay)
```

Generate the simulation data sets

```
AltRC.dat <- makeSimData(params = params, design = ph2.lay, TME = TME, nsimul = nsimul)
```

Initialize parallel processing

```
cl <- makeCluster(ncores)
registerDoParallel(cl)

cat("\n\n#### Number of simulated data sets is ",nsimul,"\n")
```

```
##
##
## #### Number of simulated data sets is  1000
```

Analyze the simulated data for model d

```
AltRC.d.stats <- foreach(k = 1:nsimul,
                    .errorhandling = "pass",
                    .inorder=TRUE,
                    .packages = c("asreml", "asremlPlus", "dae"))  %dopar%
  {
    analPower(k, dat = AltRC.dat$data, rowcol = TRUE)
  }
AltRC.d.stats <- do.call(rbind, AltRC.d.stats)
head(AltRC.d.stats, n = 25)
```

```
##    ModelFit avPairVar         pTME   pTraindiff
## 1         F  3.830771 9.181590e-02 3.211085e-03
## 2         F  2.655484 2.065089e-02 8.361242e-04
## 3         F  3.043288 2.490086e-02 1.080586e-05
## 4         F  2.470212 3.613666e-01 2.809109e-02
## 5         F  2.738263 1.192343e-02 1.893673e-03
## 6         F  3.463856 7.428152e-02 3.783817e-02
## 7         F  1.566964 1.844044e-04 1.265663e-04
## 8         F  2.605861 2.751803e-01 2.289683e-02
## 9         F  2.110747 6.638060e-03 1.079622e-03
## 10        F  3.159988 1.630865e-01 1.981369e-02
## 11        F  1.601809 5.494145e-02 6.459036e-02
## 12        F  1.603921 3.336931e-02 6.180294e-04
## 13        F  2.042459 5.532750e-01 5.075144e-02
## 14        F  2.331673 2.764475e-02 1.189118e-03
## 15        F  1.736822 2.194306e-02 1.435113e-02
## 16        F  3.252117 1.164304e-01 2.309815e-02
## 17        F  2.212938 2.521752e-03 2.674464e-04
## 18        F  2.247419 4.468870e-03 2.931423e-03
## 19        F  2.452324 1.014976e-01 1.285403e-02
## 20        F  1.835801 1.659213e-02 2.013650e-03
## 21        F  2.330248 1.134267e-01 7.830719e-04
## 22        F  2.226181 5.444070e-01 1.261880e-01
## 23        F  3.307840 1.404238e-01 7.913675e-03
## 24        F  2.634438 7.310980e-03 3.928363e-04
## 25        F  1.486081 4.349742e-05 1.593924e-04
```

```
summary(AltRC.d.stats)
```

```
##    ModelFit           avPairVar           pTME             pTraindiff
##  Length:1000        Min.   :0.6584   Min.   :0.0000006   Min.   :0.0000000
##  Class :character   1st Qu.:1.6992   1st Qu.:0.0043388   1st Qu.:0.0004288
##  Mode  :character   Median :2.1699   Median :0.0290947   Median :0.0061345
```

```
##                     Mean   :2.2487   Mean   :0.1127597   Mean   :0.0444716
##                     3rd Qu.:2.6992   3rd Qu.:0.1242645   3rd Qu.:0.0338866
##                     Max.   :5.7920   Max.   :0.9956651   Max.   :0.8586824
```

Analyze the simulated data for model c

```
AltRC.c.stats <- foreach(k = 1:nsimul,
                         .errorhandling = "pass",
                         .inorder=TRUE,
                         .packages = c("asreml", "asremlPlus", "dae"))  %dopar%
  {
    analPower(k, dat = AltRC.dat$data, rowcol = TRUE, model = "c")
  }
AltRC.c.stats <- do.call(rbind, AltRC.c.stats)
head(AltRC.c.stats, n = 25)
```

```
##    ModelFit avPairVar         pTME   pTraindiff
## 1         F  3.772821 0.0552885517 5.059761e-08
## 2         F  2.686364 0.0159777709 8.019424e-10
## 3         F  3.044656 0.0378132978 1.551897e-10
## 4         F  2.508793 0.3950522075 4.870314e-04
## 5         F  2.684005 0.0246591878 1.000333e-05
## 6         F  3.332682 0.1450644270 4.045273e-03
## 7         F  1.535540 0.0004701531 2.058024e-10
## 8         F  2.613597 0.2840193369 9.307081e-04
## 9         F  2.191932 0.0521327671 1.193266e-05
## 10        F  3.103904 0.1679533258 3.301861e-04
## 11        F  1.496281 0.1017444762 1.732507e-02
## 12        F  1.613230 0.1070263122 4.726879e-06
## 13        F  1.986987 0.3865280534 4.870292e-05
## 14        F  2.328388 0.0366855258 7.466414e-08
## 15        F  1.733307 0.1174224305 3.110862e-03
## 16        F  3.188982 0.1239349999 3.067431e-05
## 17        F  2.305788 0.0015602163 1.590486e-10
## 18        F  2.157776 0.0026709123 1.578844e-09
## 19        F  2.446822 0.0759333044 8.244316e-05
## 20        F  1.870359 0.0397202944 7.983585e-06
## 21        F  2.293524 0.1416624831 7.040626e-08
## 22        F  2.308016 0.4323528572 3.153505e-03
## 23        F  3.381252 0.2850607063 1.529789e-03
## 24        F  2.667228 0.0497006806 1.602680e-06
## 25        F  1.575421 0.0020657302 6.769798e-10
```

```
summary(AltRC.c.stats)
```

```
##    ModelFit           avPairVar           pTME            pTraindiff
##  Length:1000        Min.   :0.6513   Min.   :0.000049   Min.   :0.000000
##  Class :character   1st Qu.:1.6990   1st Qu.:0.013683   1st Qu.:0.000000
##  Mode  :character   Median :2.1689   Median :0.054814   Median :0.000016
##                     Mean   :2.2433   Mean   :0.135829   Mean   :0.014352
##                     3rd Qu.:2.6870   3rd Qu.:0.169278   3rd Qu.:0.001346
##                     Max.   :5.6747   Max.   :1.000000   Max.   :0.785593
##                     NA's   :8        NA's   :9          NA's   :8
```

Hand back clusters

```
stopCluster(cl)
```

Calculate power statistics

```
getStats <- function(stats)
{
  converged <- table(stats$ModelFit)["F"]
  power <- sum(stats$pTME <= 0.05, na.rm = TRUE)/as.numeric(table(stats$ModelFit)["F"])

  return(cbind(converged, power))
}
```

Power results

```
cat("\n\n#### Power statistics for model c)\n\n")
```

```
##
##
## #### Power statistics for model c)
```

```
getStats(AltRC.c.stats)
```

```
##   converged     power
## F       992 0.4758065
```

```
cat("\n\n#### Power statistics for model d)\n\n")
```

```
##
##
## #### Power statistics for model d)
```

```
getStats(AltRC.d.stats)
```

```
##   converged power
## F      1000  0.59
```

Save the workspace

```
save.image("AltRCpower.RData")
```