Data sets and replication code for 'Vocal regulation of individual sooty mangabey travel speed and direction'

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Data sets

The data for the four models tested in the manuscript are in four separate .csv files. The models are described below in separate sections and refer to:

(1) current speed (dataset1.csv)

(2) future speed (dataset2.csv)

(3) current direction changes (dataset3.csv)

(4) future direction changes (dataset4.csv)

The following variables appear in the data sets:

- `speed` and `controlspeed`: speed of focal individual in a given time block, `controlspeed` is the control variable for the future speed model
- `cp` and `controlcp`: whether or not focal individual's track contained a change point in a given time block, `controlcp` is the control variable for the future speed model
- `subgr.grunt`, `subgr.twitter`, `subgr.other`: vocal rates of mangabeys in the soundscape, i.e. subgroup vocal rates
- `subgr.size`: average number of individuals within 10m during a given time block
- `focal`: two letter code of focal individual
- `focal.grunt` and `focal.other`: whether or not focal produced a vocalization in a given time block
- `asso`: number of associated species
- `otherspec`: vocal rate of non-mangabeys
- `year`, `month`, `day`, `hour`, `minute`, `dt`: time and date of observation
- `sex`: sex of focal individual (male=1, female=0)
- `ac`: auto-correlation term
- `act.fefo`, `act.trvl` and `act.soc`: activity descriptor for each time block (see manuscript for definitions)

```
# packages used to calculate models:
library(lme4); library(effects); library(optimx)
```

```
## Loading required package: Matrix
```

```
packageVersion("lme4")
```

```
## [1] '1.1.11'
```

Model 1 - current speed (dataset1.csv)

```
xdata <- read.csv("dataset1.csv")
```

```
full <- lmer(speed ~ subgr.size*(focal.grunt +focal.other +subgr.twit +subgr.grunt +subgr.other)
           +asso*otherspec +sex +ac +(1|focal) +(1|dt), data=xdata, REML = F)
null <- lmer(speed ~ ac +sex +(1|focal) +(1|dt), data=xdata, REML = F)
anova(null, full)
```

```
## Data: xdata
## Models:
## null: speed ~ ac + sex + (1 | focal) + (1 | dt)
## full: speed ~ subgr.size * (focal.grunt + focal.other + subgr.twit +
## full:     subgr.grunt + subgr.other) + asso * otherspec + sex + ac +
## full:     (1 | focal) + (1 | dt)
##      Df    AIC    BIC  logLik deviance  Chisq Chi Df Pr(>Chisq)
## null  6 407.72 426.71 -197.86   395.72
## full 20 399.13 462.42 -179.56   359.13 36.592     14  0.0008501 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
final <- lmer(speed ~ subgr.size*subgr.other +focal.grunt +focal.other +subgr.twit +subgr.grunt
           +asso*otherspec +sex +ac +(1|focal) +(1|dt), data=xdata, REML = F)
coefficients(summary(final))
```

```
##                            Estimate Std. Error      t value
## (Intercept)           -0.312211050 1.27302033  -0.24525221
## subgr.size            -0.047697429 0.04807726  -0.99209961
## subgr.other            0.099798659 0.04615938   2.16204493
## focal.gruntyes        -0.142383359 0.10688397  -1.33213011
## focal.otheryes        -0.049201135 0.13243075  -0.37152350
## subgr.twit            -0.108497350 0.05056477  -2.14571051
## subgr.grunt           -0.067842967 0.04905056  -1.38312319
## asso                  -0.004567669 0.07721705  -0.05915363
## otherspec             -0.028871499 0.05483565  -0.52650965
## sex                    3.990966336 2.27482769   1.75440380
## ac                    -2.610533827 0.14123631 -18.48344719
## subgr.size:subgr.other -0.139770046 0.04099140  -3.40974054
## asso:otherspec         0.100627101 0.04977928   2.02146566
```

Model 2 - future speed (dataset2.csv)

```
xdata <- read.csv("dataset2.csv")
```

```
full <- lmer(speed ~ subgr.size*(focal.grunt +focal.other +subgr.twit +subgr.grunt +subgr.other)
           +asso*otherspec +sex +ac +controlspeed +(1|focal) +(1|dt), data=xdata, REML = F)
null <- lmer(speed ~ ac +sex +controlspeed +(1|focal) +(1|dt), data=xdata, REML = F)
anova(null, full)
```

```
## Data: xdata
```

```
## Models:
## null: speed ~ ac + sex + controlspeed + (1 | focal) + (1 | dt)
## full: speed ~ subgr.size * (focal.grunt + focal.other + subgr.twit +
## full:     subgr.grunt + subgr.other) + asso * otherspec + sex + ac +
## full:     controlspeed + (1 | focal) + (1 | dt)
##      Df    AIC    BIC  logLik deviance  Chisq Chi Df Pr(>Chisq)
## null  7 394.32 415.57 -190.16   380.32
## full 21 395.72 459.49 -176.86   353.72 26.599     14     0.0217 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
final <- lmer(speed ~ subgr.size*subgr.grunt +focal.grunt +focal.other +subgr.twit +subgr.other
           +asso +otherspec +sex +ac +controlspeed +(1|focal) +(1|dt), data=xdata, REML = F)
coefficients(summary(final))
```

```
##                            Estimate Std. Error     t value
## (Intercept)             0.19609079 0.69488197   0.2821929
## subgr.size             -0.03389037 0.06386307  -0.5306725
## subgr.grunt             0.14762172 0.06246476   2.3632801
## focal.gruntyes         -0.10652299 0.14321001  -0.7438236
## focal.otheryes         -0.27995277 0.16943302  -1.6522917
## subgr.twit             -0.02617477 0.06439339  -0.4064822
## subgr.other            -0.15376936 0.06157040  -2.4974558
## asso                   -0.05065415 0.10364668  -0.4887194
## otherspec              -0.01415996 0.06806551  -0.2080343
## sex                     0.52446698 1.24220762   0.4222056
## ac                     -1.60360912 0.12749602 -12.5777192
## controlspeed            0.01846482 0.05676961   0.3252589
## subgr.size:subgr.grunt -0.13027353 0.05545413  -2.3492124
```

Model 3 - current change points (dataset3.csv)

```
xdata <- read.csv("dataset3.csv")
```

```
full <- glmer(cp ~ subgr.size*(focal.grunt +focal.other +subgr.twit +subgr.grunt +subgr.other)
           +asso*otherspec +sex +(1|focal) +(1|dt), data=xdata, family = binomial,
           control=glmerControl(optimizer="optimx", optCtrl=list(method="bobyqa")))
null <- glmer(cp ~ sex +(1|focal) +(1|dt), xdata, family = binomial,
             control=glmerControl(optimizer="optimx", optCtrl=list(method="bobyqa")))
anova(null, full)
```

```
## Data: xdata
## Models:
## null: cp ~ sex + (1 | focal) + (1 | dt)
## full: cp ~ subgr.size * (focal.grunt + focal.other + subgr.twit + subgr.grunt +
## full:     subgr.other) + asso * otherspec + sex + (1 | focal) + (1 |
## full:     dt)
##      Df    AIC    BIC  logLik deviance  Chisq Chi Df Pr(>Chisq)
## null  4 181.36 194.02 -86.681   173.36
## full 18 189.01 245.97 -76.505   153.01 20.353     14     0.1194
```

```
coefficients(summary(full))
```

```
##                               Estimate Std. Error     z value     Pr(>|z|)
## (Intercept)                -1.67885982  0.3435108 -4.88735737 1.021985e-06
## subgr.size                 -0.78173686  0.3076331 -2.54113347 1.104937e-02
## focal.gruntyes             -0.20234145  0.4916924 -0.41152038 6.806910e-01
## focal.otheryes              0.96938133  0.6487447  1.49424169 1.351125e-01
## subgr.twit                  0.14046285  0.2748033  0.51113952 6.092534e-01
## subgr.grunt                 0.01363847  0.2591253  0.05263270 9.580246e-01
## subgr.other                 0.01841090  0.2499868  0.07364749 9.412909e-01
## asso                       -0.14067453  0.3136677 -0.44848262 6.538049e-01
## otherspec                   0.31693546  0.2673528  1.18545789 2.358365e-01
## sex                         0.04840826  0.6068623  0.07976811 9.364217e-01
## subgr.size:focal.gruntyes   0.21615621  0.6027842  0.35859631 7.198971e-01
## subgr.size:focal.otheryes   2.33960383  1.0421607  2.24495486 2.477103e-02
## subgr.size:subgr.twit      -0.07968328  0.3038457 -0.26224915 7.931294e-01
## subgr.size:subgr.grunt      0.03559487  0.3018382  0.11792699 9.061255e-01
## subgr.size:subgr.other     -0.56020120  0.2830912 -1.97887205 4.783041e-02
## asso:otherspec              0.36081024  0.2042221  1.76675440 7.726937e-02
```

Model 4 - future change points (dataset4.csv)

```
xdata <- read.csv("dataset4.csv")
```

```
full <- glmer(cp ~ subgr.size*(focal.grunt +focal.other +subgr.twit +subgr.grunt +subgr.other)
            +asso*otherspec +sex +controlcp +(1|focal) +(1|dt), data=xdata, family = binomial,
            control=glmerControl(optimizer="optimx", optCtrl=list(method="bobyqa")))
null <- glmer(cp ~ sex +controlcp +(1|focal) +(1|dt), xdata, family = binomial,
              control=glmerControl(optimizer="optimx", optCtrl=list(method="bobyqa")))
anova(null, full)
```

```
## Data: xdata
## Models:
## null: cp ~ sex + controlcp + (1 | focal) + (1 | dt)
## full: cp ~ subgr.size * (focal.grunt + focal.other + subgr.twit + subgr.grunt +
## full:     subgr.other) + asso * otherspec + sex + controlcp + (1 |
## full:     focal) + (1 | dt)
##      Df    AIC    BIC  logLik deviance  Chisq Chi Df Pr(>Chisq)
## null  5 164.01 179.19 -77.004   154.01
## full 19 168.64 226.34 -65.321   130.64 23.365     14    0.05458 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
final <- glmer(cp ~ subgr.size*subgr.other +focal.grunt +focal.other +subgr.twit +subgr.grunt
            +asso +otherspec +sex +controlcp +(1|focal) +(1|dt), data=xdata, family = binomial,
            control=glmerControl(optimizer="optimx", optCtrl=list(method="bobyqa")))

coefficients(summary(final))
```

```
##                            Estimate Std. Error    z value     Pr(>|z|)
## (Intercept)            -1.76086336  0.3629391 -4.8516771 1.224218e-06
## subgr.size             -0.42770543  0.2537608 -1.6854670 9.189850e-02
## subgr.other            -0.32255335  0.2485636 -1.2976695 1.944009e-01
## focal.gruntyes          0.45814579  0.4821099  0.9502933 3.419632e-01
## focal.otheryes          0.49891764  0.6349296  0.7857843 4.319939e-01
## subgr.twit              0.49425701  0.2545788  1.9414697 5.220133e-02
## subgr.grunt            -0.09538229  0.2409274 -0.3958964 6.921815e-01
## asso                   -0.30568344  0.2515607 -1.2151480 2.243096e-01
## otherspec              -0.02677187  0.2277026 -0.1175738 9.064053e-01
## sex                     0.71231229  0.6101830  1.1673748 2.430590e-01
## controlcp               1.31457447  0.4759048  2.7622634 5.740215e-03
## subgr.size:subgr.other -0.55925470  0.2876415 -1.9442767 5.186210e-02
```