

Threshold Task Performance Exploration

This document will be solidly based off of a simulation originally created in the early 2000's by Myerscough and Oldroyd in a paper titled "Simulation models of the role of genetic variability in social insect task allocation"

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.2.1 --
## v ggplot2 3.0.0      v purrr  0.2.5
## v tibble  1.4.2      v dplyr  0.7.6
## v tidyr   0.8.1      v stringr 1.3.1
## v readr   1.1.1      v forcats 0.3.0

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(dplyr)
```

Let's start by creating a population:

```
nSubFam <- 2
nIndiv <- 100
population <- data.frame(SubFam = rep(1:nSubFam,each=nIndiv),
                        Thresh = rep(rep(sample(0:100,nSubFam)),each=nIndiv),
                        Status = rep(0,nSubFam*nIndiv))
head(population)
```

```
##   SubFam Thresh Status
## 1      1     81      0
## 2      1     81      0
## 3      1     81      0
## 4      1     81      0
## 5      1     81      0
## 6      1     81      0
```

Now, let's run these individuals through a time-series random generator.

```
nGen <- 1200
nEachGen <- 1
Thresh <- c(50,20,80)
sumStatus <- 1

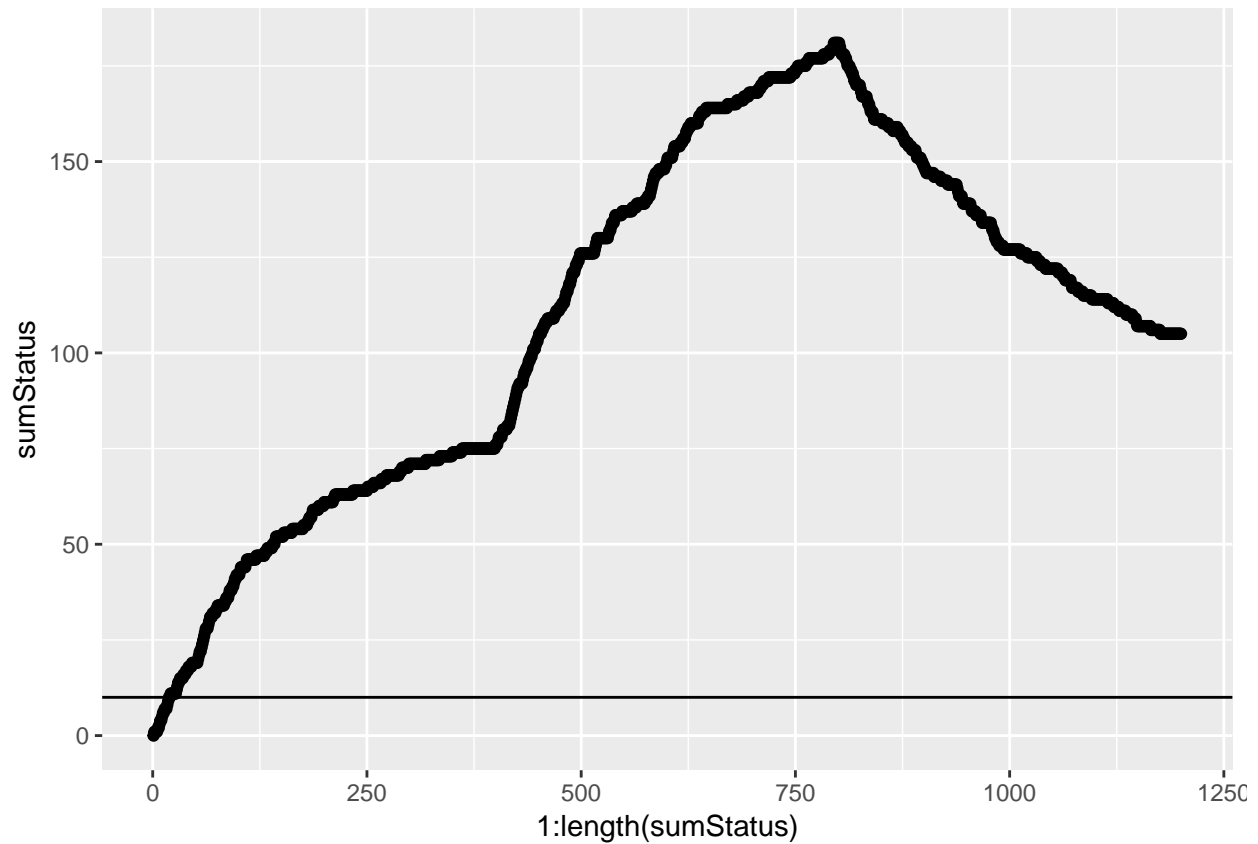
for(genNum in 1:nGen)
{
  temprows <- sample(1:nrow(population),nEachGen)
  population$Status[temprows] <-
    ifelse(population$Thresh[temprows]>Thresh[ceiling(genNum/(nGen/3))],1,0)
  sumStatus[genNum] <- sum(population$Status)
}

head(population)
```

```
##   SubFam Thresh Status
## 1      1     81      1
```

```
## 2      1      81      1
## 3      1      81      1
## 4      1      81      1
## 5      1      81      1
## 6      1      81      1
```

```
ggplot(data=data.frame(sumStatus=sumStatus)) +
  geom_point(mapping=aes(x=1:length(sumStatus),y=sumStatus)) +
  geom_hline(mapping=aes(yintercept=10))
```



This was a pretty simple simulation paper.

Myerscough, M. R., and B. P. Oldroyd. "Simulation models of the role of genetic variability in social insect task allocation." *Insectes Sociaux* 51.2 (2004): 146-152.