

note08

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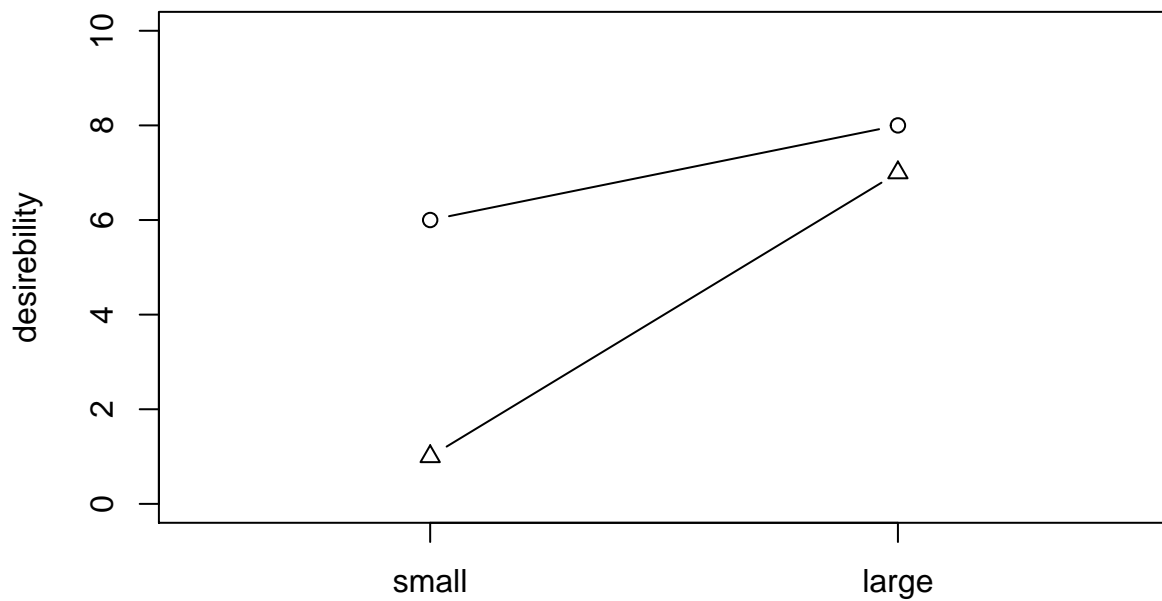
2018/01/30

1

```
kaiteki <- c(6, 5, 6, 7, 2, 1, 1, 0, 7, 8, 8, 9, 8, 7, 6, 7)
size <- factor(c(rep("S", 8), rep("L", 8)))
student <- factor(c(rep(1, 4), rep(2, 4), rep(1, 4), rep(2, 4)))
summary(aov(kaiteki ~ size + student + size:student))
```

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## size          1     64    64.00      96 4.46e-07 ***
## student       1     36    36.00      54 8.87e-06 ***
## size:student   1     16    16.00      24 0.000367 ***
## Residuals    12      8     0.67
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# figure 7.2 (a)
d <- c(6, 5, 6, 7, 2, 1, 1, 0, 7, 8, 8, 9, 8, 7, 6, 7)
one <- c(mean(d[1:4]), mean(d[9:12]))
two <- c(mean(d[5:8]), mean(d[13:16]))
plot(one, xlim=c(0.5, 2.5), ylim=c(0, 10), type="b", xlab="", ylab="desirebility", pch=1, xaxt="n")
points(two, type="b", pch=2)
axis(side=1, at=1:2, labels=c("small", "large"))
```



```
setwd("~/Dropbox/R/R で学ぶ統計学入門図版作成用 (改訂版) /付録/")
d2 <- read.csv("table7-1.csv")
d2
```

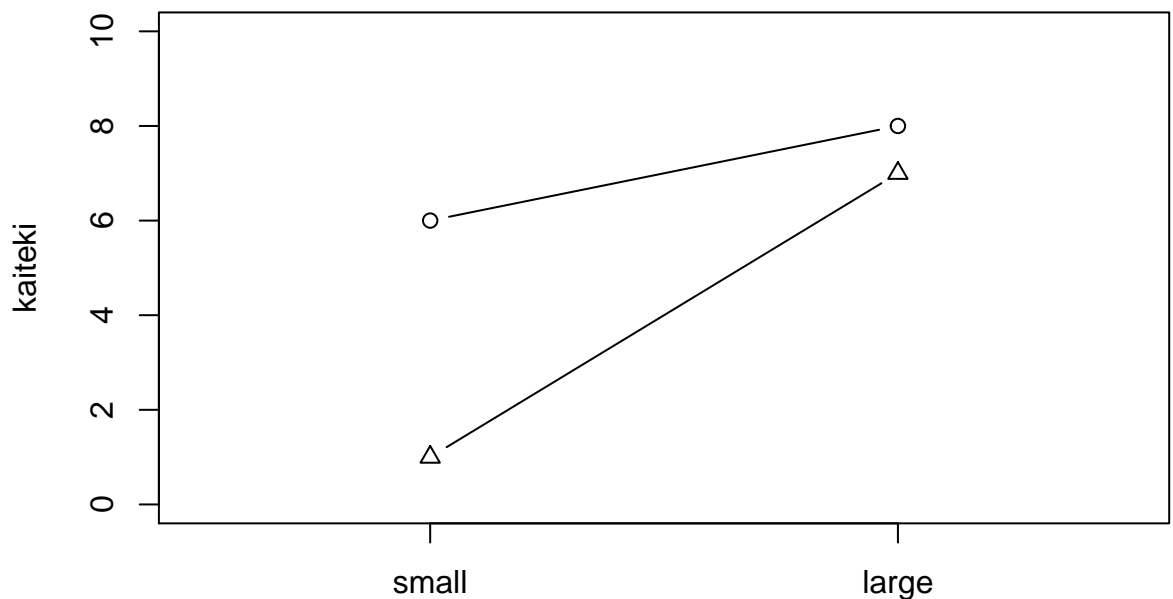
```
##      X kaiteki size student
## 1      1      6   S      1
## 2      2      5   S      1
## 3      3      6   S      1
## 4      4      7   S      1
## 5      5      2   S      2
## 6      6      1   S      2
## 7      7      1   S      2
## 8      8      0   S      2
## 9      9      7   L      1
## 10     10      8   L      1
## 11     11      8   L      1
## 12     12      9   L      1
## 13     13      8   L      2
## 14     14      7   L      2
## 15     15      6   L      2
## 16     16      7   L      2
## 17    NA     NA     NA     NA
```

```
size <- factor(d2$size)
student <- factor(d2$student)
summary(aov(d2$kaiteki ~ size*student))
```

```
##           Df Sum Sq Mean Sq F value    Pr(>F)
## size      1     64   64.00    96 4.46e-07 ***
## student   1     36   36.00    54 8.87e-06 ***
```

```
## size:student  1      16    16.00      24 0.000367 ***
## Residuals    12       8     0.67
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness

d <- d2$kaiteki
one <- c(mean(d[1:4]), mean(d[9:12]))
two <- c(mean(d[5:8]), mean(d[13:16]))
plot(one, xlim=c(0.5, 2.5), ylim=c(0, 10), type="b", xlab="", ylab="kaiteki", pch=1, xaxt="n")
points(two, type="b", pch=2)
axis(side=1, at=1:2, labels=c("small", "large"))
```



【考

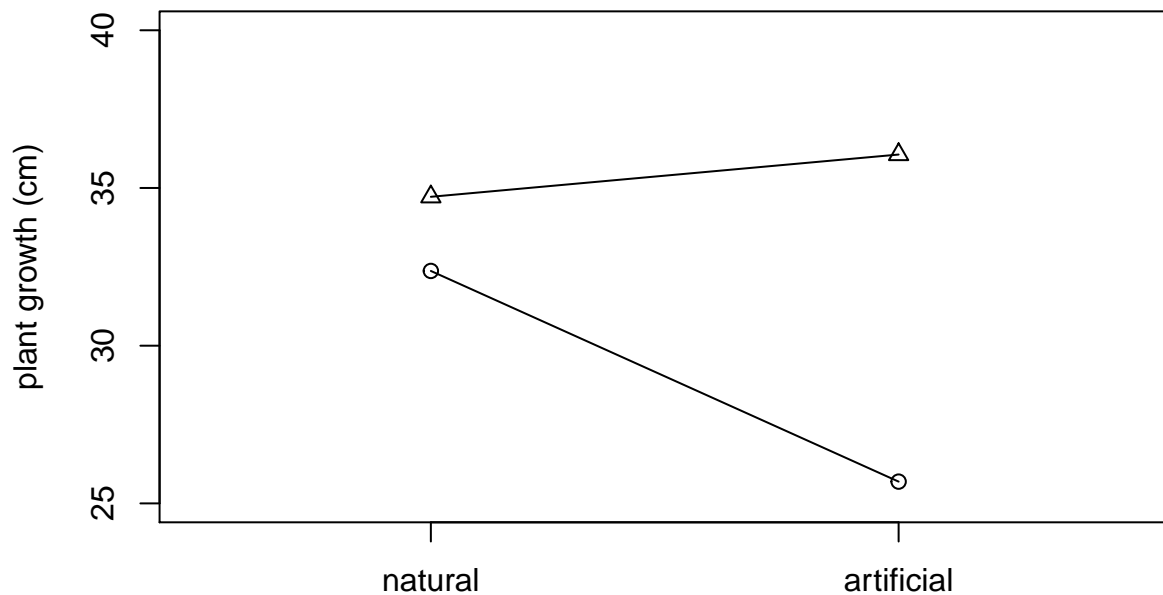
察】エクセルから数値を読み取った場合、スムーズに計算に移行できてよかった。

```
setwd("~/Dropbox/R/R で学ぶ統計学入門図版作成用（改訂版）/付録/")
d <- read.csv("table7-2.csv")
ft <- factor(d$ft)
soil <- factor(d$soil)
summary(aov(d$plant ~ ft*soil))
```

```
##           Df Sum Sq Mean Sq F value    Pr(>F)
## ft         1  404.5   404.5    36.462 6.18e-07 ***
## soil       1   71.3    71.3     6.426 0.015733 *
## ft:soil    1  160.8   160.8    14.495 0.000527 ***
## Residuals 36  399.4    11.1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
nat.soil <- c(mean(d$plant[1:10]), mean(d$plant[21:30]))
art.soil <- c(mean(d$plant[11:20]), mean(d$plant[31:40]))
plot(nat.soil, type="o", xlim=c(0.5, 2.5), ylim=c(25, 40), xlab="", ylab="plant growth (cm)", xaxt="n")
```

```
points(c(1, 2), art.soil, type="o", pch=2)
axis(side=1, at=c(1, 2), label=c("natural", "artificial"))
```



【考察】試しに factor 関数の返り値を見て見たところ、単なる行列ではなく、その要素が要因であることを示すような構造になっていた。具体的には以下のようなものである。

```
d$soil
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2
## [36] 2 2 2 2 2
```

```
factor(d$soil)
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2
## [36] 2 2 2 2 2
## Levels: 1 2
```

```
d$ft
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 2 2 2 2
## [36] 2 2 2 2 2
```

```
factor(d$ft)
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 2 2 2 2
## [36] 2 2 2 2 2
## Levels: 1 2
```

```
c(4,5,3,4,1,42,2,6)
```

```
## [1] 4 5 3 4 1 42 2 6
```

```
factor(c(4,5,3,4,1,42,2,6))
```

```
## [1] 4 5 3 4 1 42 2 6
## Levels: 1 2 3 4 5 6 42
```