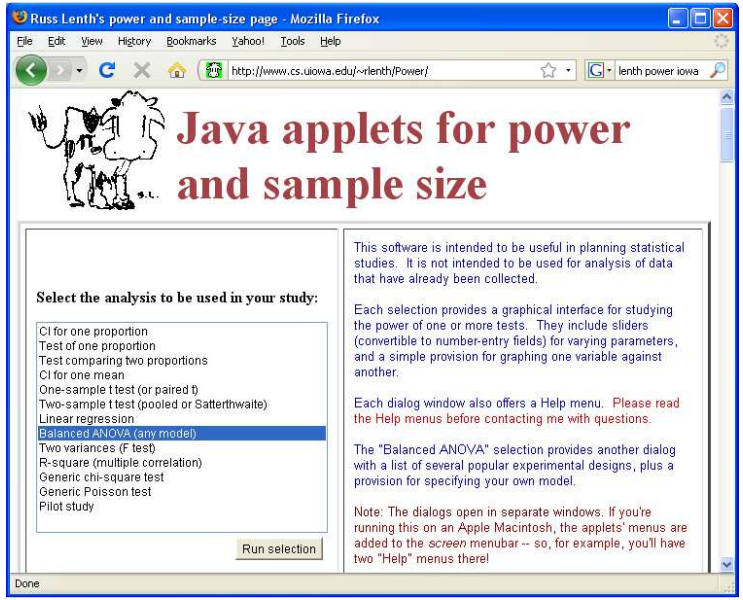
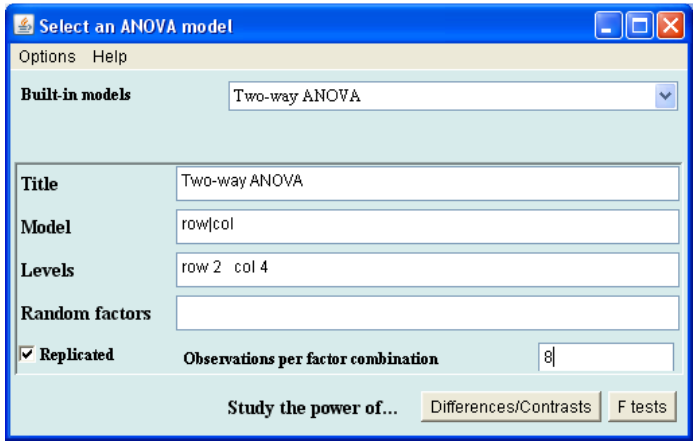
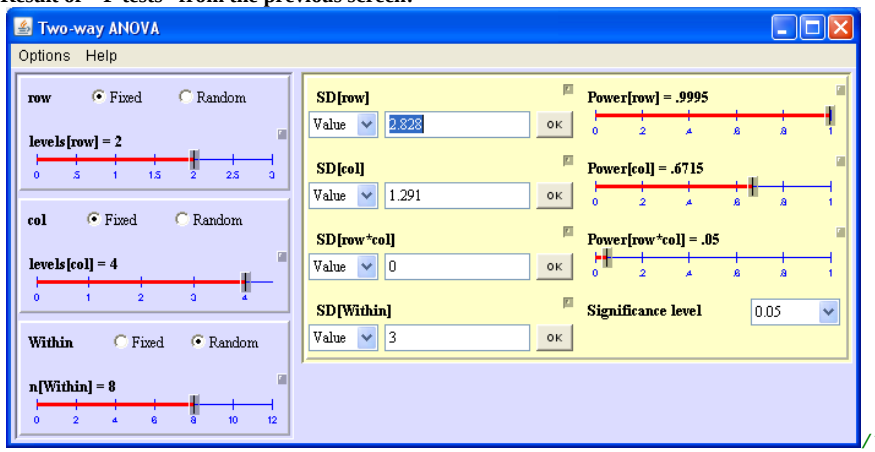
Power for a Two-way Using the Lenth Program



Select "Balanced ANOVA (any model)" (above).
Select "Two-way ANOVA" from the "Built-in models" menu, then select "F tests" (below).



Result of "F tests" from the previous screen:



/*

To get power for A effect (row), B effect (col), or the interaction you need to compute the effect sizes, as defined by the Lenth program. These can be computed based on the MS values from a two way model using the assumed values for the true means. The sd values needed are:
sqrt (MS for factor / # levels in factors not included)

```
> InData <- read.csv("C:/hess/STAT512/RNotes/ExpDesign2/ED2_PowerData.csv")
> InData
   A  B Y
1 A1 B1 1
2 A1 B2 2
3 A1 B3 3
4 A1 B4 4
5 A2 B1 5
6 A2 B2 6
7 A2 B3 7
8 A2 B4 8
>
> Ameans <- aggregate(Y ~ A, data = InData, FUN = mean)
> Ameans
   A   Y
1 A1 2.5
2 A2 6.5
> sd(Ameans$Y)
[1] 2.828427
>
> Bmeans <- aggregate(Y ~ B, data = InData, FUN = mean)
> Bmeans
   B Y
1 B1 3
2 B2 4
3 B3 5
4 B4 6
> sd(Bmeans$Y)
[1] 1.290994
>
```

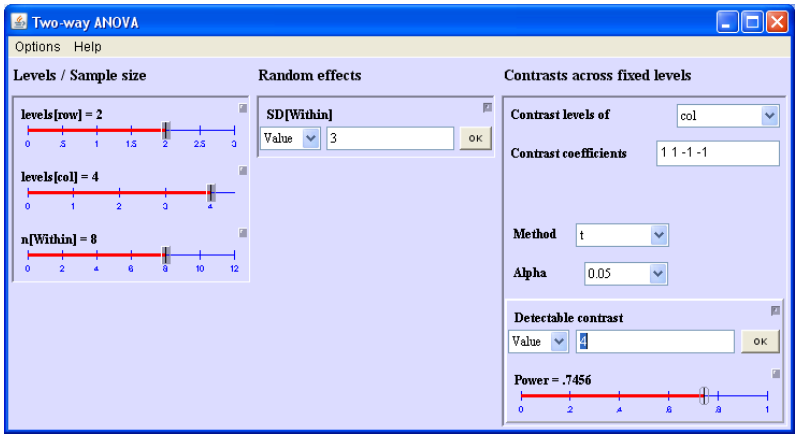
```
> #We get a warning due to lack of replication!
> anova(lm(Y ~ A*B, data = InData))
Analysis of Variance Table

Response: Y
          Df Sum Sq Mean Sq F value Pr(>F)
A          1     32  32.000
B          3     10   3.333
A:B        3      0   0.000
Residuals  0      0
Warning message:
In anova.lm(lm(Y ~ A * B, data = InData)) :
  ANOVA F-tests on an essentially perfect fit are unreliable
> #sdA, 4 levels of factor B
> sqrt(32/4)
[1] 2.828427
> #sdB, 2 levels of factor A
> sqrt(3.333/2)
[1] 1.29093
> #sdA:B
> sqrt(0)
[1] 0
```

The above values are the SD(row), SD(col), and SD(row*col) that define the effect sizes.

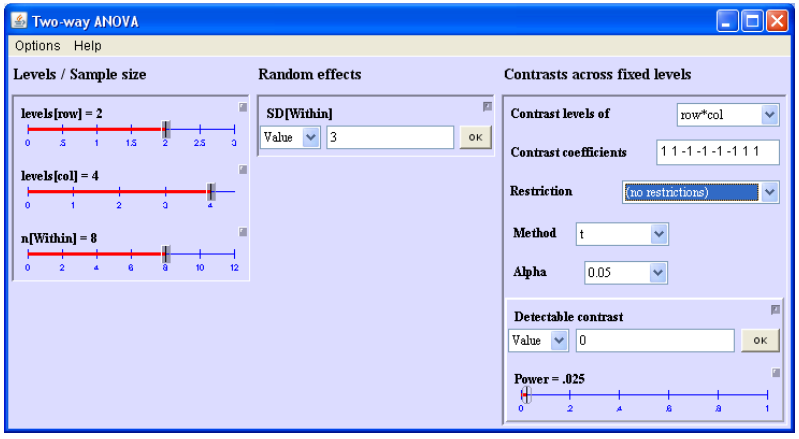
Power for contrasts: **Select "Differences/Contrasts", instead of "F tests".**

Case 1: Contrast the first two levels of B versus the last two levels of B. Coefficients are 1 1 -1 -1.
"Detectable contrast" value is the contrast coefficients, multiplied by the column means:

	1	2	3	4	
	5	6	7	8	
Column means	3	4	5	6	**1(3)+1(4)-1(5)-1(6) = 4 ("Detectable contrast")**



Case 2: Does the difference between the first two cols and the last two cols depend on rows?
List the contrast coefficients first row then second row, etc.
1(1)+1(2)-1(3)-1(4)-1(5)-1(6)+1(7)+1(8) = 0 ("Detectable contrast")



Why is power equal to 0.025 (instead of 0.05, i.e. alpha)?