

# 2D User Interfaces - Exercises

## Tutorial 6

### Evaluating User Interfaces

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## Overview

- Purpose of the evaluation
- How to evaluate
- Theory of the analysis (ANOVA)
- Exercise Assignment

## Purpose of the evaluation

Evaluation of the three different implementations of a list:

- Simple List
- Fisheye List
- Treeview List

## How to evaluate

Follow these steps to create your evaluation of your user interface:

- Load the hierarchical data from the `music.xml`.
- Chose **10 to 20 items** (for each implementation) to be found by the users.
- Select at least **12 people/friends** as users.

## How to evaluate (objective)

- For each implementation and user **measure the time** to find/navigate to the items.
- Split the users in three equal groups (i.e. 3x5) and alternate the implementations for the groups, to avoid a learning effect.
- For each user and implementation permute the items to be found.

## How to evaluate (subjective)

- For each implementation and user develop a questionnaire **TOGETHER (mailinglist!)**. You can use the NASA TLX (**T**ask **L**oad **I**ndex) or SUS (**S**ystem **U**sability **S**cale)

## Theory of the analysis (ANOVA)

ANOVA = **A**nalysis of **v**ariance

Idea: Find out, if the results (of the user study) of different implementations can be considered to be different.

Make a  $H_0$ -Hypothesis: the mean values of the results are the same.

Make a F-Test to reject  $H_0$ .

# F-Test

Sample data from the detailed description:

<http://davidmlane.com/hyperstat/B83437.html>

<u>Aspirin</u>	<u>Tylenol</u>	<u>Placebo</u>
3	2	2
5	2	1
3	4	3
5	4	2

Calculate the MSE (MeanSquareError):

$s^2$  = squared variance

a = number of groups (here 3)

$$MSE = \frac{\sum s_i^2}{a}$$

## F-Test

Calculate the variance of the means of each group  $s^2$ :

$$s^2 = \frac{\sum (X - M)^2}{N - 1}$$

$X$  = mean of each group (here: 4, 3, 2)

$M$  = mean of the means (here:  $(4+3+2)/3 = 3$ )

$N$  = number of groups (here: 3)

Calculate the MSB (MeanSquareBetween):

$$\text{MSB} = ns_M^2$$

$n$  = number of elements of each group (here number of users: 4 )

$s^2$  = variance of the means (see above)

## F-Test

Calculate the F-Value:

$$FValue = \frac{MSB}{MSE}$$

(here:  $FValue = MSB/MSE = 4/1.111 = 3.6$ )

Decide with the F-Table if the  $H_0$ -Hypothesis can be rejected (the results are different)

F-Table:

<http://www.itl.nist.gov/div898/handbook/eda/section3/eda3673.htm>

$v_1$  = number of groups – 1 (here:  $3 - 1 = 2$ )

$v_2$  = total number of results – number of groups (here:  $12 - 3 = 9$ )

The critical value for the F-Value is „4.256“.

$3.6 < 4.256 \rightarrow H_0$  can not be rejected  $\rightarrow$  there is no significant difference.

## Exercise Assignment

- Do it! :-)
- Q/A: [maierp@in.tum.de](mailto:maierp@in.tum.de) / [toennis@in.tum.de](mailto:toennis@in.tum.de)
- See you back here on 15.01.09 at 13.00h for the lab session