

## Exercise 5 – Mensch-Maschine-Interaktion 1

### Keystroke-Level Modelling

(Per-group homework, 2 weeks)

#### 1. Analyse the Task

Download and start the Java application you find on the course page.

Consider the following task:

*“Maximise the application screen. Enter the number 13975222. Close the application.”*

As input method, you will put a (computer) mouse on the floor and control it with one **foot**.

Three different methods for initiating a mouse click will be compared for performing this task (these can be chosen within the application):

**Method 1 (“normal”)**: use your toes to normally press the mouse button

**Method 2 (“space bar”)**: use the space bar (not with the foot!) to click on the button where the mouse cursor is currently located

**Method 3 (“dwell time”)**: use a dwell time, i.e. after 700ms not moving the mouse, a click is generated at the current mouse position (if you want, you can modify the source code to modify the waiting time – WaitThread.java)

In order to create the three Keystroke-Level Models for this task (one for each method), analyse the necessary steps and write them down. Use the KLM operators as given in the lecture. This prescribes the correct level of abstractness. If an action cannot be directly modelled by one or a series of operators, invent a name for a new operator for this step.

Produce a table which lists each of the 3 sequences of KLM operators with their according time values (if available). Below the table, briefly discuss your model in words. Whenever you see more than one way of modelling an aspect, explain the different possibilities and discuss your decision. For example, what difference does it make if the number is known by heart or read from a sheet of paper?

#### 2. Measure the Values of Missing Operators

In order to complete the models, you need the times for some additional operators that do not exist yet. Setup and run a small study (for this exercise, it is ok to have 4 participants, e.g. from your group) to find out average values for these operators. Be sure that the average value is representative for all numbers (not only the one mentioned above).

(turn the page)

### 3. Verify the validity of your Model

Complete your model from item 1 with the data from item 2. Now run another small study where some people perform the task with all three methods. Measure the times they needed and compare these with the model. (For this exercise, it is ok to use the same people as in the first study).

#### For your report:

- Write down the three KLMs
- Describe which steps in the task used KLM operators that did not exist
- Keep track of potential errors that participants make and explain how you treated those.
- Describe the setup and result of the study to measure the values for the new operators
- Describe how you treated that pressing a number might depend on the previously pressed number.
- For the second study in item 3, briefly explain why your participants need to do some test runs before you measure their times and how you can prevent learning effects to carry over from one method to the other.
- Make some statements about how well the model correlates with the reality and why there might be discrepancies.
- Check (statistically) whether one of the methods is significantly faster than the others (use you real data for this, not the model).

#### Submission:

- Send your solution to your tutor by email. Use an attachment named exercise5-groupN.zip (N is the number of your group). Use the email subject “mml exercise 5 group N”.
- The attachment must contain:
  1. Report (PDF format)
  2. An Excel sheet, which contains your data, the statistical analysis and graphs
- **Deadline:** 10.06.2009, 12 noon
- Present your results in the next tutorial (~ 5 minutes). Explain the three models, so that they can be compared to the other teams' models. Discuss different ways of modelling that your team considered as well as the results of the statistical evaluation.  
In general, focus on details that might differ from other teams, e.g. errors that occurred during the studies.