

Exercise 4 – Mensch-Maschine-Interaktion 1

Law of Steering

(Per-group homework, 1 week)

1. Conduct the study

Conduct the experiment you designed in Exercise 2. Use the software you developed in Exercise 3. Use at least four participants per condition. Consider the following instructions:

- Be careful to keep all other parameters fixed.
- For each condition, each participant has to do two rounds. The first one is just for training and thus not to be included in your data. Each round consists of the 64 trials that were mentioned in the last exercise.
- If the participant touches a tunnel wall this is counted as an error. You can let the participant complete the trial nevertheless in order to not frustrate him.
- Log all data.

2. Interpret the results

Analyze the data you got from the experiment. Use MS Excel to do a statistical analysis and to transform them into graphs that summarize the most important results.

Write a full report about your experiment containing the following sections:

1. Title
2. Abstract
3. Introduction
4. Method
5. Results
6. Discussion
7. References
8. (Appendices)

You can re-use components from the detailed description of the setup, which you handed in two weeks ago (in Exercise 2). The report should contain the most important facts as well as the graphs, which summarize your findings.

(turn page)

3. Verify the validity of the Law of Steering

The Law of Steering predicts how long it takes a user to navigate a pointer through a tunnel. For a straight tunnel with length A and constant width W , the average time to pass it is:

$$T_C = a + b \cdot \frac{A}{W}$$

The term A/W is called index of difficulty (ID).

Compare the results you collected in your experiment with the Law of Steering. Find a and b for each of your conditions.

Follow these steps to analyze the data:

- Throw away the data from the training round.
- Group the trial data by condition. Further analyze each condition separately.
- Clean the data of tasks where an error was made. Note the error rate (errors/trials) for every combination of width/length of the tunnel.
- For every combination of width/length of the tunnel calculate the average completion time of all participants.
- Calculate the index of difficulty (ID) for every combination.
- Plot all data points of the direction group in a scatterplot. The x axis is the ID, the y axis is the completion time.
- Fit a linear function $a+b \cdot x$ through the data points and document a and b .
- Is there a difference between the two conditions?

Hand in a separate document that summarizes your assessment of the Law of Steering.

Submission:

- Send your solution to your tutor by email. Use an attachment named exercise4-groupN.zip (N is the number of your group). Use the email subject “mmi1 exercise 4 group N”.
- The attachment must contain:
 1. Report (PDF format)
 2. An Excel sheet, which contains your data, the statistical analysis and graphs
 3. Assessment of the Law of Steering (PDF format)
 4. A document that specifies how the work was split between the team members (“task-sharing.pdf”).
- **Deadline:** 27.05.2009, 12:00 noon
- Present your results in the next tutorial (~ 5 minutes)