Models of Perception and Action
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BSc in Cognitive Science
Spring 2019

Exam

Write short, concise texts to answer the following questions. Where given, the page ranges refer to standard pages according to the study regulations. The percentages indicate the weight of each task on the grade.

1. *Multimodal integration* [1-3 pages]
   1.1. Explain the crossmodal binding problem. [5%]
   1.2. Discuss how integrating information from multiple senses poses an advantage for cognitive processing. [10%]
   1.3. How can we measure whether information from multiple senses is integrated? Demonstrate this by summarizing two relevant studies from the literature. [20%]

2. *Efficient movement* [1-3 pages]
   2.1. What does the "Index of Difficulty" of speeded aiming movements capture? How can it be modulated? [5%]
   2.2. Think about and discuss a practical application where identifying (and possibly modulating) Index of Difficulty could be useful. [15%]
   2.3. Discuss different strategies of the motor system that support efficient movement. [15%]

3. *Movement analysis* [0.5-2 pages for 3.1. and 3.3. together]
   3.1. Briefly summarize the main research question of this given article (link) in your own words and provide reasons why motion tracking was chosen as a method to investigate it. [10%]
   3.2. Download this given data set (link) from a single trial of the study and do the following steps in R. Include your commented code and the resulting figures in your overall exam document, i.e. do not just send a link to your GitHub etc. [15%]
      - Load the data set and rename the columns to sample, time, x, y, z.
      - Plot x versus z and add meaningful labels.
      - Correct the z dimension by flipping all values so that more positive ones are shown upwards, i.e. like the movement was actually performed. Make a new plot of x and z.
      - Calculate z velocity and plot it against time.
      - Apply a Butterworth filter to z velocity with reasonable parameters. Plot the filtered velocity on top of the unfiltered one.
      - Make a final plot with z and the nicely filtered velocity over time.
   3.3. Describe (= text, not code) what relation z velocity has to z and how z velocity can be used to extract the maximal vertical extension. [5%]