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Assignment 7

(Due: 19.12.2022)

Task 1 Assessment of a Study

(a) The main research question of the study is to find the best technique among the following three strategies to visualize geographical phenomenon - an animated map, small multiple maps, and a single map with glyphs. This should help the experts in understanding the propagation patterns in a better way.

(b)
- **The study design**
  The study design is experimental where all participants are exposed to each three types of visualization. The dataset was reused with 3 variations and task type presentation order was randomly assigned to each participant. Within-subject design
- **The study setting**
  For each technique, a participant has to perform 10 training trials (2 repetitions per task), and 5 measured tasks × 6 repetitions = 30 main trials. In total, the experiment consists of 18 participants × 3 visualizations × 5 tasks × 6 repetitions = 1620 main trials.
- **The tasks**
  For tasks that call for a binary answer (Direction, Scope and Hops), half of the repetitions are allocated to each answer. After submitting answer, participants had to report confidence on Likert scale and fill a post-hoc questionnaire about the perceived difficulty of the task. After finishing all trials, participants had to also rank the three visualization techniques and justify their ranking.
- **The participant assignment**
  Task type presentation order is randomly assigned for each participant, as are repetitions.
- **The independent and dependent variables**
  - **independent variables** : 3 visualization techniques (Animation, Small Multiples, Glyph Map)
  - **dependent variables** : Completion Time, Error Rate, Self-reported Confidence, Self-reported Easiness to Complete Task

(c)
1. Differences between conditions in terms of information conveyed or additional procedures.
2. Differences in visual encoding between techniques.

Provide the same information using equivalent visual encoding channels and provide equivalent levels of interactivity.

(d)
- on a 3-point Likert scale (highly confident, confident, not confident/random selection).
- on a 5-point Likert scale from very easy (5) to very difficult (1).

(e) Small-multiple maps (Small Multiples) performed best overall, but animated maps (Animation) and maps augmented with glyphs (Glyph Map) outperformed them when determining propagation Direction and Arrival time, respectively. Looking more closely at individual measures, Small Multiples is faster than Animation and Glyph Map overall.

(f)
- Advantage : The results of experiments more easily show causal relationships among the variables, because many variables can be controlled.
- limitation : Controlled lab study can be artificial. That said, most are done in a controlled laboratory environment, which tends to eliminate many real-world effects.

Task 2 Study Design

(a)
- H_0: No difference between experimental treatments
- H_1: Scatter plots should perform better than parallel coordinates

(b) I would choose Within-subjects design. Because this design needs fewer participants than Between-Group Design and increases the probability of discovering a true difference between Scatter plots and parallel coordinates.

(c) For tasks that call for a answer with three choices(positive, negative and none) about correlation. For each technique, a participant has to perform 6 training trials(3min) (2 repetitions per task), and 3 measured tasks $\times$ 8 repetitions = 24(12min) main trials. In total, the experiment consists of 12 participants $\times$ 2 visualizations $\times$ 3 tasks $\times$ 8 repetitions = 576 main trials.