Predicting Insight-Directed Behavior in a Brain Imaging Analysis Task

Caroline Ziemkiewicz*
Brown University

Abstract

The analysis of brain imaging data is key to many vital research areas in neuroscience and cognition. However, as in many applications in scientific visualization, analyzing these data is both difficult and slow-paced. Improvements to the speed and accuracy of the analysis process could have a significant impact on the ability of these researchers to perform more and better experiments. In this work, we present a novel approach to identifying the patterns that lead to wasted time in the analysis process, as well as the patterns that are most productive. Our approach combines observation-driven task analysis with insight evaluation and measures of cognitive load to isolate common interaction patterns that either precede or lead away from useful discoveries. Our results show a predictable set of patterns that could be automatically identified as part of evaluation or adaptive analysis software.

Index Terms: H.5.m [Information Interfaces and Presentation (HCI)]: Miscellaneous

1 Introduction

- Motivation: brain imaging analysis. Critical area. Lots of different types of data, mishmash of analysis software. Bottleneck in research.
- What's needed is a better understanding of the analysis process; how it works, what makes it not work.
- Our approach: task analysis + insight and cognitive load. Task analysis with more data about what's going on in the black box.

2 Related Work

- Task analysis in vis: Springmeyer, Isenberg, etc.
- Insight evaluation: Saraiya and North, etc.
- Cognitive load: ???

3 Experiment

- Participants: brain scientists around Brown/Tufts area. Working on different problems, some similar data and issues.
- Task: something specific and limited. What works across participants? Can we design something with a clear answer or answers? One interface or set of interfaces?
- Methods: how to measure cognitive load? (GSR?) Standard insight evaluation and coding. Video and interaction capturing.

4 Results

[t]

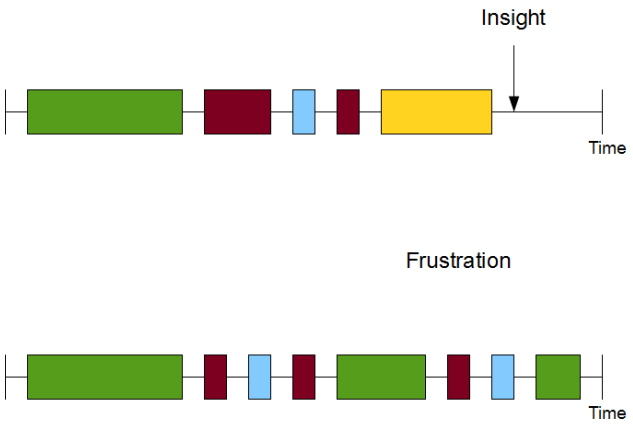

Figure 1: Common operation patterns associated with productive and unproductive behavior.

- Common patterns in general. Are there individual differences? Can they be grouped?
- Patterns correlated with insights and cognitive load. What patterns precede frustration points? What patterns precede an insight? What about different qualities of insight?
- More detail about patterns: is there a point where a good pattern turns into a bad pattern?

5 Discussion

- Are the patterns predictable? Do they associate with heuristics about good analysis, interface design?
- More about individual differences if there are any.
- Modeling for evaluation. Would a model be part of this paper or a followup?
- What other situations might this be generalized to?

6 Conclusion

- Limitations, future work. Model? Generalizing?
- Restate introduction, etc.

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References

*e-mail: cziemki@cs.brown.edu