Natural Scales and Context Awareness: Two Keys to Successful Personal Visual Analytics

David S. Ebert
School of ECE
Purdue University
465 Northwestern Ave.
West Lafayette, IN 47907 USA
ebertd@purdue.edu

Abstract
Personal visual analytics will only be successful when the system is designed to be engaging, intuitive, powerful, and adaptive. Natural scales and context awareness are, therefore, keys to the success of personal visual analytics.

Author Keywords
Visual analytics, personal visual analytics, natural scales, context awareness, visualization.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Position Statement
Personal visual analytics (PVA) has both unique challenges and unique opportunities for making people more effective in using data to organize, manage, enjoy, and experience many aspects of their lives. Natural and appropriate visualization, exploration, and analysis can provide new insights, new possibilities to explore, and unexplained connections. However, the PVA tools must provide the right information in an easily understood manner and at the appropriate level
(natural scale) for the user’s task, exploration, or decision. This is even more crucial than in professional settings because people will quickly discard a tool or not take the time to use it in their everyday activities where they will be willing to spend more time laboring through the use of a tool when trying to get their job or work done.

Therefore, we must provide data at the appropriate natural scale for their exploration and analysis and one that uses device, location, time, and other activity information to determine the most effective way to present, aggregate, and combine data for use. The use of the term natural scale is not clearly defined in the literature and is an area we have been researching. We use it to have a combined/dual meaning. Scales of aggregation/grouping (level of detail) are more natural when the aggregation matches the levels of detail that humans use for the exploring and analyzing the data. Scales are more useful and natural for analysis when they lead to better analytical results: too coarse aggregation leads to too much variation among the multidimensional characteristics of the data while too fine a level of analysis leads to failure of statistical analysis techniques and predictions because of sparseness (e.g., too many zeroes). The most natural scale for display/analysis also depends on the task, perceptual and cognitive preferences of the user, and the device.

Similarly, for engaged use and utility, we need to adapt the PVA environment to the current context to anticipate the most appropriate tasks and representations. Understanding that the person is in a shopping mall or their home can change what information to show and how to show information related to their daily food consumption for example (e.g., in a shopping mall, you can add in nutrition information from nearby restaurants, while at home, given the time, you can provide daily totals and also show what they consumed for the rest of the day yesterday, last week, etc.). The rate of speed of the location of the device can also be used to determine different information that would be useful while driving, biking, walking, or hiking. Weather information can also reduce the data that is relevant based on the previous usage for similar conditions. There is currently a wealth of data available from sensors on devices and webservers that can be integrated with historical use data to make the displays and analysis tools more relevant, appropriate, and engaging, leading to more natural inclusion of personal visual analytics into omnipresent use.

Acknowledgements
This work was supported by funding from The United States Department of Homeland Security Centers of Excellence Program.