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Rae Earnshaw
David Kasik
John Vince
Pak Chung Wong *Editors*

Expanding the Frontiers of Visual Analytics and Visualization



Springer

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John Dill • Rae Earnshaw • David Kasik •
John Vince • Pak Chung Wong

Editors

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Jim Thomas, 1946–2010

Foreword

Jim Thomas—An Appreciation

It is fitting that so many of Jim Thomas's friends and colleagues have written papers and gathered them together in this book as a lasting tribute. Jim was exceptional—he was one of the most friendly, cheerful and determined people I have ever known. He was a maker of things to happen. He saw challenges and needs—and acted on them. He was a doer. He was one of the computer graphics community's most dedicated volunteers. An early workshop he organized led to the UIST conferences. He founded a new field of research. He understood the power of positive thinking, using it as he relentlessly pursued his goals with a contagious enthusiasm and vision that drew folks—including me—to join with him in that pursuit.

Jim spent a year with me in the early 1980s when I was at The George Washington University. Jim and I collaborated on software development and networking, and I came to know and respect him. We interacted frequently thereafter, and my respect for Jim continued to grow. He was awesome.

But first, a few facts. Jim was born in 1946, earned the BS in Mathematics (Eastern Washington University, 1968) and the MS in Computer Science (Washington State University, 1970), worked at General Motors Research Lab until 1976, and then at the Department of Energy's Pacific Northwest National Laboratory (PNNL). He officially retired in mid-2009, continuing to be professionally active until his sudden death on August 6, 2010.

As an activist volunteer, Jim's most notable contributions were as ACM-SIGGRAPH 1980 conference program chair, ACM-SIGGRAPH 1987 conference co-chair, ACM-SIGGRAPH Chair from 1987 to 1992, *IEEE Computer Graphics and Applications* Editor-in-Chief from 1999 to 2002 and IEEE Visualization conference co-chair in 2003 and 2004. Jim served the United States as a Science Adviser to the Department of Homeland Security and to the Army's Simulation, Training and Instrumentation Command.

Many of Jim's technical interests converged to what I believe time will judge to be his most lasting contribution—articulating and tirelessly developing the discipline of Visual Analytics—using data analysis and information visualization to

turn data into actionable knowledge. While computer graphics was at the center of most of Jim's work, he realized that Information Visualization is only one part of a more complex process that starts with analyzing, organizing, and abstracting massive amounts of data and presenting the data via information visualization in ways that support our human cognitive processes of analysis and reasoning that lead to insights.

With support from the Department of Homeland Security, Jim recruited and convened a series of workshops involving about 30 thought leaders in the constituent disciplines that contribute to Visual Analytics. They went on to write the defining book *Illuminating the Path: The Research and Development Agenda for Visual Analytics*, which Jim co-edited.

The legacies of Jim's determined development of Visual Analytics are amazingly impressive. Working with and through others, we now have:

- National Visualization and Analytics Center at PNNL,
- Annual Visual Analytics Conference as part of IEEE VisWeek,
- FODAVA (Foundations of Data Analysis and Visual Analytics) research initiative of the US National Science Foundation and Department of Homeland Security, led by Georgia Tech and involving over 60 university researchers in the United States,
- The CCIDADA (Command, Control and Interoperability Center for Advanced Data Analysis) DHS Center of Excellence, led by Rutgers with many university partners,
- The VACCINE (Visual Analytics for Command, Control, and Interoperability Environments) DHS Center of Excellence, led by Purdue, also with many university partners, and
- Similar research programs in Canada, the EU, Australia and New Zealand.

Jim's career trajectory prepared him well for this seminal contribution. His longest-standing interest was of course computer graphics itself, going back to his early days at General Motors Research Labs and carrying throughout all his professional work and to his many service contributions to SIGGRAPH and IEEE.

Jim was fascinated with BIG DATA. Back in the late 1970s and early 1980s he co-led the ALDS (Analysis of Large Data Sets) project. I saw ALDS at PNNL, running on a Digital VAX/780 computer and Ramtek 9400 color raster display. ALDS was the precursor of systems that integrate statistical analyses and information visualization—complete with what were then called “self-describing data sets” and what we now call XML-tagged data. And of course it was done jointly with statisticians. I consider ALDS to be the precursor of PNNL's decade-later ThemeScape system, which used statistical analysis of large collections of text documents to create a visual overview of the document's themes.

Another of Jim's interests was Interaction. He appreciated its centrality to computer graphics. Concerned that SIGGRAPH's Conference on Computer Graphics and Interactive Techniques was too much about modeling and rendering and not enough about interaction, Jim organized the 1980 workshop on Graphical Interaction Techniques at the Battelle conference center in Seattle. This brought together

about 30 thought leaders in graphics interaction; the proceedings were highly influential in defining the field. Jim had the vision and drive to make the conference happen, and figured prominently in formulating the intellectual content of the workshop report. The intellectual seeds nourished at that conference led to the creation of the UIST (User Interface and Software Technology) conference series that continues to this day, under the joint aegis of ACM-SIGCHI and ACM-SIGGRAPH.

Jim left us too early, at the age of 64. But he left us with lasting intellectual and organizational contributions. Beyond that, for me and for many others, he left us with a wonderful example of leadership—always positive, always supportive, always goal-focused. I wrote a toast for the party celebrating Jim’s life: “To one of the most friendly, cheerful and determined guys I have ever known—that was his key to success professionally and in life—may we all learn from Jim.”

Thank you Jim, for all you did for us and for all you taught us.

Georgia Tech
Atlanta, Georgia, USA
November 2011

Jim Foley

Preface

The concept of this book arose out of discussions among the editors on how best to honor the contributions of Jim Thomas to the fields of visual analytics and visualization. It was agreed that a book would be appropriate as a number of summaries of his work had appeared in journals. It was also agreed it should be forward looking rather than simply reflect on his many seminal contributions to the field. One of his favorite sayings was “*The best is yet to come*” and this volume was put together in this spirit. It therefore seeks to explore the frontiers of visual analytics and visualization, concentrating on the new research that is paving the way for future developments and applications.

We are very grateful to all the people who responded to our invitation to contribute and who completed their chapters very efficiently. In a number of cases they involved collaborators, or members of their research group, as co-authors of their papers and we therefore also thank the co-authors for their various contributions.

The following were the invited contributors to this volume—

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Further chapters were contributed by the co-editors.

The book begins with the dynamics of evolving a vision based on some of the principles that Jim Thomas and colleagues established and in which his leadership was evident. It is then followed by chapters in the areas of visual analytics, visualization, interaction, modeling, architecture, and virtual reality. The book concludes with the key area of technology transfer to industry. Each chapter contains a summary of the paper in an Abstract. These Abstracts are also visible on the web in the electronic book corresponding to this volume.

We thank Springer for publishing this book and for their support and assistance in the editorial and production processes. We particularly thank Beverley Ford, Helen Desmond and Ben Bishop who dealt with a number of complex issues speedily and efficiently.

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