Visualisation of Eye Tracking Data

Roy G. Biv, Ed Grimley, Member, IEEE, and Martha Stewart

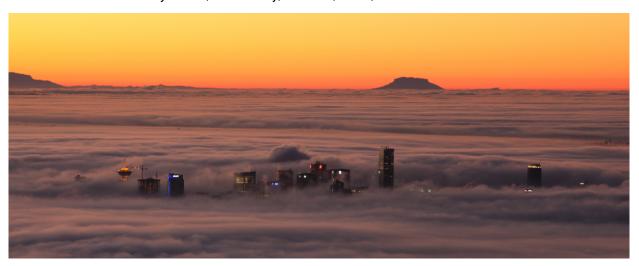


Fig. 1. Teaser figure caption. Note that the teaser may not be wider than the abstract block.

Abstract—Abstract should contain: short introduction, short description and short conclusion of the whole project.

Index Terms-keywords inserted here

1 Introduction

template set-up The numbered sections of the report are the actual template that we (the group) need to fill in and write. The rest of the text below the set-up, are more examples that can be helpful when writing the report as it needs to be done in a very specific way.

In the introduction, the project needs to be introduced. In needs to be explained what the project should contain, the demands the customer made, what SCRUM is, etc etc

2 RELATED WORK

In this section, an overview of related projects needs to be given. It needs to be explained what those websites or tools do and how or not that differs from our project.

3 DATA MODEL AND DATA PROCESSING

Here, the data set structure and how it is changed and manipulated to work with it needs to be explained.

Subsections may be necessary here.

4 THE VISUALISATION TOOL

In this section we present the actual visualization application that we have developed.

- Roy G. Biv is with Starbucks Research. E-mail: roy.g.biv@aol.com.
- $\bullet \ \ \textit{Ed Grimley is with Grimley Widgets, Inc.}. \ \textit{E-mail: ed.grimley} @aol.com.$
- Martha Stewart is with Martha Stewart Enterprises at Microsoft Research.
 E-mail: martha.stewart@marthastewart.com.

Manuscript received xx xxx. 201x; accepted xx xxx. 201x. Date of Publication xx xxx. 201x; date of current version xx xxx. 201x. For information on obtaining reprints of this article, please send e-mail to: reprints@ieee.org. Digital Object Identifier: xx.xxxx/TVCG.201x.xxxxxxx

4.1 Design Decisions

Here a list of criteria is given

4.2 Graphical User Interface

Explain what the user can do basically. So, this describes the different options for the user.

4.3 Visualisation Techniques and Algorithms

Here the 4 different visualisations are explained.

4.4 Interaction techniques

5 APPLICATION EXAMPLE

Give some concrete examples of the visualisations and explain some of the outcomes globally.

6 DISCUSSION AND LIMITATIONS

In this section improvements and limitations need to be discussed.

7 CONCLUSION AND FUTURE WORK

Give a summary of the project and further implementations.

INTRODUCTION

This template is for papers of VGTC-sponsored conferences such as IEEE VIS, IEEE VR, and ISMAR which are published as special issues of TVCG. The template does not contain the respective dates of the conference/journal issue, these will be entered by IEEE as part of the publication production process. Therefore, please leave the copyright statement at the bottom-left of this first page untouched.

USING THE STYLE TEMPLATE

- If you receive compilation errors along the lines of "Package ifpdf Error: Name clash, \ifpdf is already defined" then please add a new line "\let\ifpdf\relax" right after the "\documentclass[journal]{vgtc}" call. Note that your error is due to packages you use that define "\ifpdf" which is obsolete (the result is that \ifpdf is defined twice); these packages should be changed to use ifpdf package instead.
- Note that each author's affiliations have to be provided in the author footer on the bottom-left corner of the first page. It is permitted to merge two or more people from the same institution as long as they are shown in the same order as in the overall author sequence on the top of the first page. For example, if authors A, B, C, and D are from institutions 1, 2, 1, and 2, respectively, then it is ok to use 2 bullets as follows:
 - A and C are with Institution 1. E-mail: {a | c}@i1.com.
 - B and D are with Institution 2. E-mail: {b | d}@i2.org.
- The style uses the hyperref package, thus turns references into internal links. We thus recommend to make use of the "\autoref{reference}" call (instead of "Figure \ref{reference}" or similar) since "\autoref{reference}" turns the entire reference into an internal link, not just the number. Examples: Fig. 2 and Table 1.
- The style automatically looks for image files with the correct extension (eps for regular LATEX; pdf, png, and jpg for pdfLATEX), in a set of given subfolders (figures/, pictures/, images/). It is thus sufficient to use "\includegraphics{CypressView}" (instead of "\includegraphics{pictures/CypressView.jpg}").
- For adding hyperlinks and DOIs to the list of references, you can use "\bibliographystyle{abbrv-doi-hyperref-narrow}" (instead of "\bibliographystyle{abbrv}"). It uses the doi and url fields in a bibTEX entry and turns the entire reference into a link, giving priority to the doi. The doi can be entered with or without the "http://dx.doi.org/" url part. See the examples in the bibTEX file and the bibliography at the end of this template.
 - Note 1: occasionally (for some LATEX distributions) this hyper-linked bibTEX style may lead to compilation errors ("pdfendlink ended up in different nesting level ...") if a reference entry is broken across two pages (due to a bug in hyperref). In this case make sure you have the latest version of the hyperref package (i.e., update your LATEX installation/packages) or, alternatively, revert back to "\bibliographystyle{abbrv-doi-narrow}" (at the expense of removing hyperlinks from the bibliography) and try "\bibliographystyle{abbrv-doi-hyperref-narrow}" again after some more editing.

Note 2: the "-narrow" versions of the bibliography style use the font "PTSansNarrow-TLF" for typesetting the DOIs in a compact way. This font needs to be available on your LATEX system. It is part of the "paratype" package, and many distributions (such as MikTeX) have it automatically installed. If you do not have this package yet and want to use a "-narrow" bibliography style then use your LATEX system's package installer to add it. If this is not possible you can also revert to the respective bibliography styles without the "-narrow" in the file name.

DVI-based processes to compile the template apparently cannot handle the different font so, by default, the template file uses the abbrv-doi bibliography style but the compiled PDF shows you the effect of the abbrv-doi-hyperref-narrow style.

BIBLIOGRAPHY INSTRUCTIONS

- Sort all bibliographic entries alphabetically but the last name of the first author. This LATEX/bibTEX template takes care of this sorting automatically.
- Merge multiple references into one; e. g., use [?,?] (not [?] [?]). Within each set of multiple references, the references should be sorted in ascending order. This LATEX/bibTEX template takes care of both the merging and the sorting automatically.
- Verify all data obtained from digital libraries, even ACM's DL and IEEE Xplore etc. are sometimes wrong or incomplete.
- Do not trust bibliographic data from other services such as Mendeley.com, Google Scholar, or similar; these are even more likely to be incorrect or incomplete.
- Articles in journal—items to include:
 - author names
 - title
 - journal name
 - year
 - volume
 - number
 - month of publication as variable name (i. e., {jan} for January, etc.; month ranges using {jan #{/}# feb} or {jan #{--}# feb})
- use journal names in proper style: correct: "IEEE Transactions on Visualization and Computer Graphics", incorrect: "Visualization and Computer Graphics, IEEE Transactions on"
- Papers in proceedings—items to include:
 - author names
 - title
 - abbreviated proceedings name: e.g., "Proc.\
 CONF_ACRONYNM" without the year; example: "Proc.\ CHI", "Proc.\ 3DUI", "Proc.\ Eurographics", "Proc.\ EuroVis"
 - year
 - publisher
 - town with country of publisher (the town can be abbreviated for well-known towns such as New York or Berlin)
- article/paper title convention: refrain from using curly brackets, except for acronyms/proper names/words following dashes/question marks etc.; example:
 - paper "Marching Cubes: A High Resolution 3D Surface Construction Algorithm"
 - should be entered as "{M}arching {C}ubes: A High Resolution {3D} Surface Construction Algorithm" or "{M}arching {C}ubes: A high resolution {3D} surface construction algorithm"
 - will be typeset as "Marching Cubes: A high resolution 3D surface construction algorithm"
- · for all entries
 - DOI can be entered in the DOI field as plain DOI number or as DOI url; alternative: a url in the URL field
 - provide full page ranges AA--BB
- when citing references, do not use the reference as a sentence object; e.g., wrong: "In [?] the authors describe ...", correct: "Lorensen and Cline [?] describe ..."

EXAMPLE SECTION

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam You can use nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam the margins erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua [?,?]. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est.

EXPOSITION

Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat [?].

$$\sum_{j=1}^{z} j = \frac{z(z+1)}{2} \tag{1}$$

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

Lorem ipsum

Lorem ipsum dolor sit amet (see Table 1), consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum.

Mezcal Head

Lorem ipsum dolor sit amet (see Fig. 2), consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

Duis Autem

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et

CG&A @ VIS TVCG @ VIS SciVis conf VAST conf InfoVis VAST sum

accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est. Lorem ipsum dolor sit amet.

Ejector Seat Reservation

Duis autem [?]¹ vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat,² vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

Confirmed Ejector Seat Reservation Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat [?]. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi.

Rejected Ejector Seat Reservation Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie

¹The algorithm behind Marching Cubes [?] had already been described by Wyvill et al. [?] a year earlier.

²Footnotes appear at the bottom of the column.

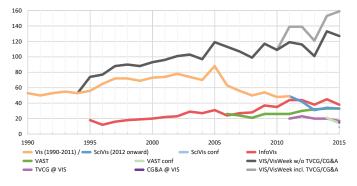


Fig. 2. A visualization of the 1990–2015 data from Table 1. The image is from [?] and is in the public domain.

7.1 Vestibulum

Vestibulum ut est libero. Suspendisse non libero id massa congue egestas nec at ligula. Donec nibh lorem, ornare et odio eu, cursus accumsan felis. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Donec dapibus quam vel eros mattis, id ornare dolor convallis. Donec at nisl sapien. Integer fringilla laoreet tempor. Fusce accumsan ante vel augue euismod, sit amet maximus turpis mattis. Nam accumsan vestibulum rhoncus. Aenean quis pellentesque augue. Suspendisse sed augue et velit consequat bibendum id nec est. Quisque erat purus, ullamcorper ut ex vel, dapibus dignissim erat.

Quisque sit amet orci quam. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam pharetra, nunc non efficitur convallis, tellus purus iaculis lorem, nec ultricies dolor ligula in metus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos. Aenean eu ex nulla. Morbi id ex interdum, scelerisque lorem nec, iaculis dui. Phasellus ultricies nunc vitae quam fringilla laoreet. Quisque sed dolor at sem vestibulum fringilla nec ac augue. Ut consequat, velit ac mattis ornare, eros arcu pellentesque erat, non ultricies libero metus nec mi. Sed eget elit sed quam malesuada viverra. Quisque ullamcorper, felis ut convallis fermentum, purus ligula varius ligula, sit amet tempor neque dui non neque. Donec vulputate ultricies tortor in mollis.

Integer sit amet dolor sit amet turpis ullamcorper varius. Cras volutpat bibendum scelerisque. Maecenas mauris dolor, gravida eu elit et, sodales consequat tortor. Integer id commodo elit. Pellentesque sollicitudin ex non nulla molestie eleifend. Mauris sagittis metus nec turpis imperdiet, vel ullamcorper nibh tincidunt. Sed semper tempus ex, ut aliquet erat hendrerit id. Maecenas sit amet dolor sollicitudin, luctus nunc sit amet, malesuada justo.

Mauris ut sapien non ipsum imperdiet sodales sit amet ac diam. Nulla vel convallis est. Etiam dapibus augue urna. Aenean enim leo, fermentum quis pulvinar at, ultrices quis enim. Sed placerat porta libero et feugiat. Phasellus ullamcorper, felis id porta sollicitudin, dolor dui venenatis augue, vel fringilla risus massa non risus. Maecenas ut nulla vitae ligula pharetra feugiat non eu ante. Donec quis neque quis lorem cursus pretium ac vulputate quam. Cras viverra tellus vitae sapien pretium laoreet. Pellentesque fringilla odio venenatis ex viverra, quis eleifend tortor ornare. Ut ut enim nunc. Vivamus id ligula nec est dignissim eleifend.

Nunc ac velit tellus. Donec et venenatis mauris. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut vitae lectus vel ante mollis congue. Vestibulum at cursus velit. Curabitur in facilisis enim. Vestibulum eget dui aliquet risus laoreet laoreet. Phasellus et est id magna interdum venenatis. Donec luctus vehicula justo sed laoreet. Quisque tincidunt suscipit augue, in molestie sem accumsan sed.

8 CONCLUSION

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum.

ACKNOWLEDGMENTS

The authors wish to thank A, B, and C. This work was supported in part by a grant from XYZ (# 12345-67890).