

C.R.A.W.LAB

Document Style Guide

March 13, 2023

1 Introduction

We need to create high-quality, professional papers and presentations; they are the primary representation of our work to the outside world. The following guidelines create uniform standards of quality for our group and ensure that our knowledge is retained and is easily accessible by both our group and other researchers. In addition, adopting standard practices will make it easier for us to collaborate and improve the efficiency of our technical communication process.

2 The Process

The actual, physical writing of any document is only a very small part of preparing it for submission. We will relentlessly revise and edit any document leading up to its submission deadline. Be prepared for this. All good authors (even fiction writers) will tell you how important the editing process is. If you want to be a good writer, you have to be a *great* editor.

To this end, as paper deadlines approach, expect to exchange the paper with me on a daily basis. I will suggest many changes. Make the improvements I suggest, but do not limit your changes to correcting *only* the errors that I have explicitly pointed out. You should continue to edit, revise, and refine the document on your own.

3 Figures

Creating high-quality figures will make our job as authors much easier. In fact, the readers should be able to understand the key points of our papers by looking *only* at the figures. This is how most researchers read papers, looking first at the figures to get the main points. If they are still interested, then they will continue to reading the text.

Figure 1 is an example of the quality of figure that we need to be generating. All the lines are easily seen and distinguishable from one another. They are of sufficient thickness and are unique in both color and line style. In addition, the fonts are easily read; they are all at least as large as the document's body text.

Some points to remember when generating figures are:

1. Create all figures with professional, vector graphic drawing applications such as Affinity Design, Sketch, Adobe Illustrator, Inkscape, or Graphic (formally iDraw). Do not use the

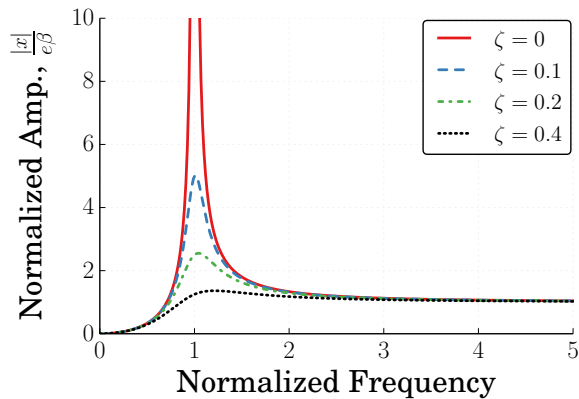


Figure 1: A High-Quality Plot

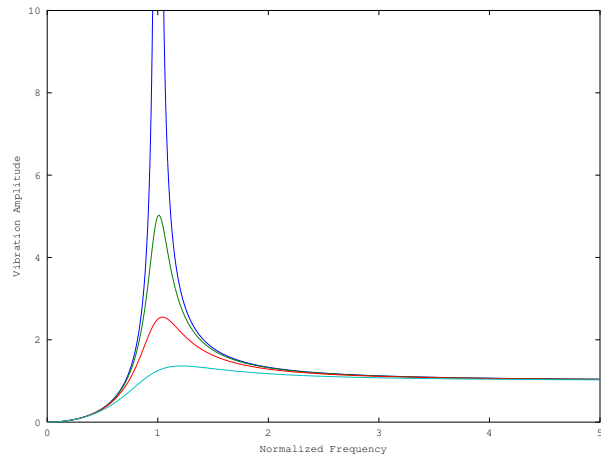


Figure 2: The Terrible “Standard” MATLAB Output

sketching tools that come with Word, Powerpoint, Keynote, or Pages, and *definitely* do not use MS Paint. These create amateur-looking figures.

2. The default parameters for most plotting packages are terrible. Do not use the defaults or the plotting package that comes with Excel to create figures. These create amateur-looking plots that are difficult to read. For example, Figure 2 shows a plot generated using the MATLAB defaults. The fonts are too small, the lines are too thin, and the line types are not differentiated. This figure is infinitely worse than Figure 1.

There are templates in the lab GitHub repository that can be used to create high-quality figures in MATLAB/Octave and Python. Use them.

3. Use large fonts in the legends and axis labels. The fonts in figures should be at least as big as the fonts in the text of the document. Recheck the font size after inserting them into the document.
4. Do not use unnecessary gridlines. They make the figures look crowded and messy, and they obscure the data. The problem gets even worse when the paper is photocopied.
5. Similarly, remove the top and right axes lines. They are not needed.
6. All lines in your plot should be different colors *and* different line types.
7. Do not rely *only* on color to distinguish various lines within plots. You can and should use color, but when the plots are copied in black and white, the various curves should also be distinguishable.
8. If you use symbols like squares and circles to distinguish data points, make sure they are large.
9. If you have only a few data points, do not connect them with a line. This can be misleading. Leave them as individual symbols.

10. Make sure that the legend clearly distinguishes between the data represented in the plot, preferably by what distinguishes them in an engineering sense. For example, if you are comparing three responses, then they can not all be labeled “Response”. You might, for example, label according the controller used or parameter that differed between the various responses.
11. Save any data in your plots along with the plot. If you do not, the plots will be difficult to modify without the source code that was used to create them. Rerunning the source code can be difficult for you six-months removed from its creation. It’s also especially difficult for other people that are following on your work in the future. Make it easy on your future self and your lab descendants.
12. If you are comparing data across several plots, retain the same line style and color for each set of data across the series. For example, if the ZV-shaped response is a blue, solid line on the first plot of the comparison series, it should be that blue, solid line in subsequent figures.
13. Similarly, if you are comparing data across several plots, retain the same axis limits across the series.
14. Do not label axes by a variable name alone. This forces the reader to look back to the written text to decipher the plot.
15. Use consistent fonts and font sizes throughout all your figures in a document.
16. Use an aspect ratio of 1.5 units wide by 1 unit high.
17. Do not cover data with a legend.
18. Maximize the area of the data being shown in the figure.
19. We have lab templates and matplotlib defaults that satisfy most of these requirements. Use them!
20. For plots in two-column formatted papers, it generally best to fill the column width with the figure. You can use the `\columnwidth` command in L^AT_EX to do so:

```

%
\begin{figure}[tb]
\begin{center}
\includegraphics[width = \columnwidth]{figures/filename}
\caption{Descriptive Figure Caption}
\label{fig:figure_label}
\end{center}
\end{figure}
%
```

21. Place all figures (and tables) at the top or bottom of the column in which they appear. To do so in L^AT_EX include `[tb]` when you begin the figure environment, as in the example above.

22. Discuss each figure in the text and explain the axes and what is interesting about the data. Do not make your reader figure out what is important about the figures. It is our job to tell them.
23. Do not refer to a series of figures all at once, *e.g.* “Figures 3-7 show the experimental responses.” This puts all the pressure on the reader to sort through the figures and figure out what is important about each one. Introduce and explain each figure as it is referenced. It is our job to explain our results to the readers, not theirs to figure it out.
24. Use a consistent figure reference style within the document. In other words, do not mix Fig. and Figure style figure referencing. However, for the abbreviated figure reference style, *e.g.* Fig. 1, if the figure reference begins a sentence, then it should still be spelled out completely.
25. Use `\label{fig:figure_label}` to label your figures, where `figure_label` is a descriptive name for the figure being labeled. This will make the figure `\ref{}` commands in your document much easier to understand.

4 Tables

1. Unless dictated by the conference or journal template, avoid vertical lines in tables. They add nothing to understanding and clutter the table.
2. Unless otherwise specified, do not draw lines between every row or columns (*i.e.* Tables need not look like Excel documents.). You may use such lines to make logical separations in the data contained in the table.
3. Place all tables (and figures) at the top or bottom of the column in which they appear. To do so in \LaTeX include `[tb]` when you begin the table environment, as in the figure example above.
4. Use `\label{table:table_label}` to label your figures, where `table_label` is a descriptive name for the table being labeled. This will make the table `\ref{}` commands in your document much easier to understand.

5 Equations

1. Unless otherwise specified, equations are referenced in text by (#) only, where # is the equation number. The only time that the word Equation is needed is when the equation number would start a sentence, “Equation (#) showed...”.
2. If an equation directly follows its introduction in the text, do not cite its number. For example, an equation number is not needed in sentences like:

The equation of motion is given by:

$$m\ddot{x} + c\dot{x} + kx = f \tag{1}$$

where m is the system mass, c is the damping coefficient, k is the spring constant, and f is the external force.

3. Define all symbols in an equation either right before the equation is shown or directly after the equation, as in the text following (1).
4. Do not use tiny fonts in equations.
5. Use `\label{eqn:equation_label}` to label your equations, where `equation_label` is a descriptive name for the equation being referenced. This will make the equation `\ref{}` commands in your document much easier to understand.

6 References

1. In literature review sections and paper introductions, we need to not only identify work that has come before ours, but also clearly point out its relationship to the work that we are presenting. Do *not* make the reader figure this out on his/her own; they won't make the same conclusions that you want them to.
2. Use BibDesk to manage your reference library.
3. In your BibDesk library, use descriptive citation keys. I recommend `lastname:YYn`, where `lastname` is the lead author's last name, `YY` is the two-digit form of the year of publication, and `n` is a unique letter.
4. Use `BIBTEX` to manage references within the document. Do *not* number and order your reference manually. You should use the `\cite{}` command in the text and the `\bibliography{}` command at the end of the document:

```
Proin ornare dignissim lacus. Pellentesque vel dui sed orci
faucibus iaculis. Suspendisse dictum magna id purus tincidunt
rutrum \cite{author1:YYa, author1:YYb, author2:YYa}. Nulla congue.
Vivamus sit amet lorem posuere dui vulputate ornare. Phasellus
mattis sollicitudin ligula. Duis dignissim felis et urna
\cite{author3:YYa, author1:YYa}. Integer adipiscing congue metus.
```

```
% Then, at the end of the document where you would like the
bibliography to be:
\bibliography{bibtex_filename}
% The .bib file in the above command contains the "authorN:YYn"
citation IDs used in the document.
```

After you make any changes to the `\cite{}` commands in the document, there is a three step process needed for the reference changes to propagate through the document. You need to:

- (a) Compile the \LaTeX document
 - (b) Process with \BibTeX then
 - (c) Compile with \LaTeX *twice*
5. When citing multiple papers at a time, include them all in the same $\text{\cite{}}$ command, like $\text{\cite{author1:YYa, author1:YYb, author2:YYa}}$ in the example above.
 6. Reference all appropriate papers, and include an acknowledgement section if appropriate. Appropriate acknowledgements include funding sources and collaborators that helped with your work, but did not contribute enough to be a co-author.
 7. Make sure that papers outside our group get appropriate referencing.
 8. For input shaping papers, make sure that papers from outside of Dr. Singhose's group at Georgia Tech are referenced.
 9. Make sure that you use the most up-to-date reference. If you are referencing a conference paper, then make sure there is not a journal version of the work. If there is, cite the journal version instead.
 10. Always try to include references from the conference or journal to which the paper is being submitted.

7 TODOs and Placeholders

The `todonotes` package is good for managing TODOs in a \LaTeX document:

To match our lab-style TODOs, add this to your \LaTeX preamble:

```
\usepackage[linecolor=black,backgroundcolor=lightgray]{todonotes}
```

Then, you can use:

```
\todo{Some explanation of the thing to do}
```

to put a note in the margin, or

```
\todo[inline]{Some inline TODO}
```

to make an inline paragraph of the todo.

You can also make placeholder figures, using the command:

```
\missingfigure{Some text explaining the missing figure}
```

which can be used inline with the normal figure environment. Just comment out the \includegraphics command and add the \missingfigure one above or below it, like:

```

%
\begin{figure}[tb]
\begin{center}
\missingfigure[figwidth = 3in]{Description of the Figure to be Added}
%\includegraphics[width = 3in]{figures/figure_filename}
\caption{Descriptive Caption}
\label{fig:descriptive_label}
\end{center}
\vspace{-0.2in}
\end{figure}
%
```

8 Filenames and L^AT_EX Folder Structure

It's beneficial to establish a standard folder and file-naming structure for our papers. It ensures that when collaborating with other students (and me), your collaborators can find the information they need while working on the paper. The folder structure for our papers is:

- **Main Folder:** This is the top-level folder for your paper. It should be named: (Conference or Journal Abbreviation) - (Short description of topic) - YYYY where YYYY is the four digit year of the conference
 - **figures** - the main folder that contains all the figures used in the paper
 - * **sources** - a subfolder with the folder source files, if different than the included version. For example, this is where the `.idraw` files for figures will be kept.
 - * **unused** - As your paper is edited, there will likely be figures that are no longer included in the paper. It is advisable to store them, so that adding them back in later revisions is easy.
 - **Submission documents** - a folder containing any submission, registration, etc. confirmations
 - **Reviews** - Most of our papers will be reviewed before being accepted. Store those reviews here. It is also helpful to store the initial submission version here.
 - **Presentation** - For conferences, include the presentation file (named in a similar manner as the `.tex` source file) and any supporting figures, movies, etc. in this folder.

Name the `.tex` source file similarly to the folder, but avoid using spaces and replace the hyphen (-) with an underscore (_), like that below.

```
Conf0rJourAbbrev_ShortDescriptionOfTopic_YYYY.tex
```

A screenshot of an example directory structure is shown in Figure 3. For conferences, you should also include the presentation file (named in a similar manner as the `.tex` file) and any supporting figures, movies, etc. for it in subfolder named **Presentation**.

It's also best to name figures in a way that they are identifiable via filename alone; `Response1.pdf` is not a good name. Something like `ZV_1mMove_Umax50_Def0p5.pdf` is much better. Remember that

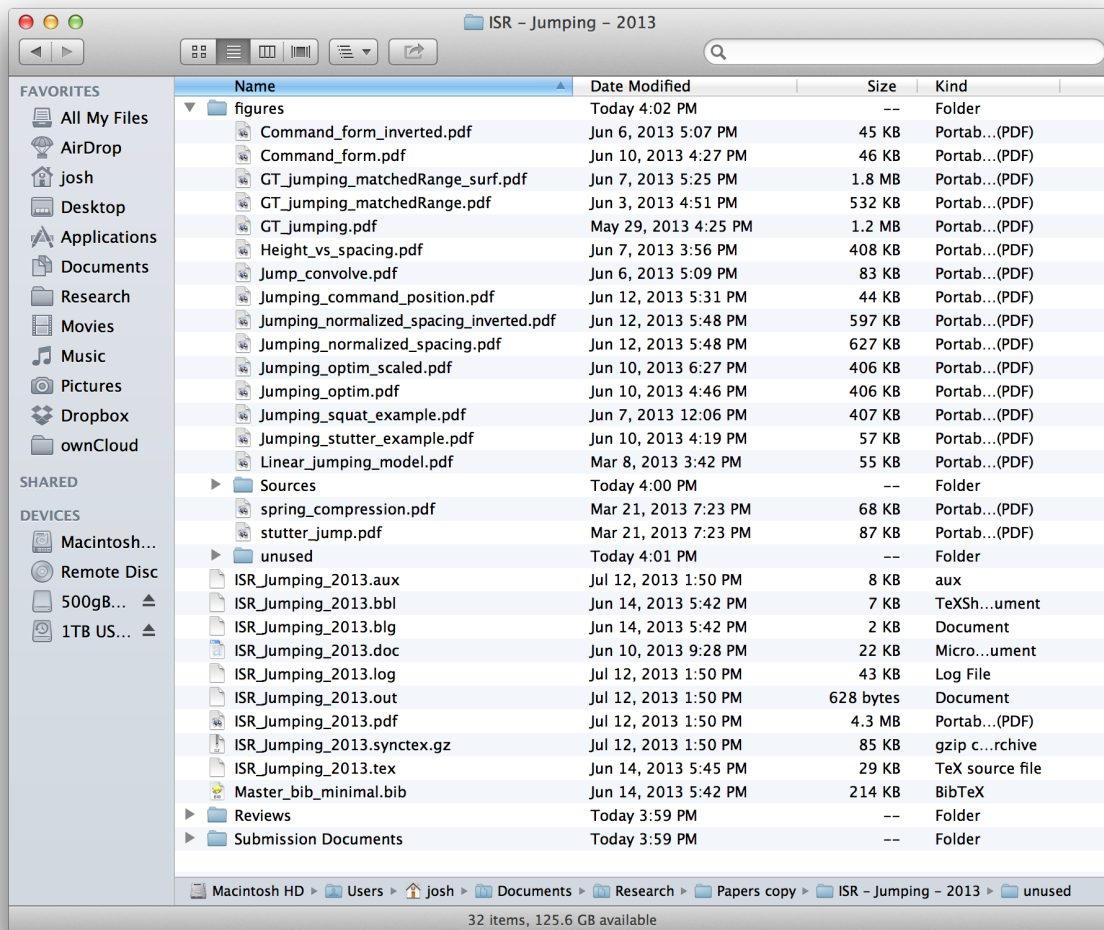


Figure 3: A Screenshot of an Example \LaTeX Folder Structure

you will need the figures months after you generate them, either for final submissions or inclusion in your thesis. Failing to name them in a recognizable manner will force you to have to regenerate them all at that time (wasting time that none of us have to spare). Naming figures this way is also *absolutely* necessary when collaborating with others.

9 Miscellaneous Tips

1. Revise your paper thoroughly before giving it to *anyone* else to read. This includes spell-checking. If you do not do this, then you are being disrespectful; you're sending the message that your time is more valuable than theirs.

One good way to edit is to read the paper out loud. Mistakes are typically very obvious this way. You can also use the Speak-to-Text tools, like http://crawlab.org/blog/2013/09/13/speak_to_proof.html and http://crawlab.org/blog/2013/12/04/speak_to_proof_

`service.html`. I use this method of proofreading before I submit anything.

2. When editing your paper, particularly as you are approaching a final draft, try to read it as someone who has not seen the work before. Remember that you have spent months working on the problem, but your reader (and the paper reviewers) will likely be seeing it for the first time.
3. When helping someone edit their paper, be a tough reader. Failing to make suggestions or point out weaknesses in someone's approach or argument is *not* being nice. It is doing them a disservice and wasting time for both of you. If you really want to be nice, be a tough reader and challenge the author. It will make the paper better.
4. In the header, state where the paper is being submitted to, *i.e.*, "Submitted to: 2023 American Control Conference" and the submission date.

```
% Include the fancyhdr package at the beginning of your document
\usepackage{fancyhdr}

% Then, before the \begin{document} declaration:
\lhead{\footnotesize{\textit{Submitted to:} 2023 American Controls
    Conference}}
\rhead{\footnotesize{\today}}

\pagestyle{fancyplain}
```

5. Similarly, while the paper is under preparation, state where the paper will be submitted to and include the current date and submission due-date.

```
% Include the fancyhdr package at the beginning of your document
\usepackage{fancyhdr}

% Then, before the \begin{document} declaration:
\lhead{\footnotesize{\textit{To be submitted to:} 2023 American
    Controls Conference -- Due: mm/dd/yy}}
\rhead{\footnotesize{\textit{Draft} -- \today}}

\pagestyle{fancyplain}
```

6. Even if the final template for the conference or journal does not contain page numbers, include them on all initial submissions and during the preparation process. This makes it easy for your collaborators to discuss changes with you.
7. Terminology: Input shaping is a very specific technique. If you are convolving a fixed impulse sequence with any arbitrary reference command, then you are input shaping.

If you are convolving an impulse sequence with some special baseline command, *i.e.*, a step input and your technique will not work with any general baseline command, then you are command shaping. If your impulse sequence changes as a function of move distance, nonlinearity, deflection limit, etc., then you are command shaping.

You can also use the term command generation, but that should nominally be used for cases when you are also putting some thought into what the baseline command should be.

8. Do not refer to figures or tables parenthetically, such as “(see figure 3)”. Use a clause such as, “as shown in Figure 3”.
9. Use `\label{sec:section_label}` to label your sections, where `section_label` is a descriptive name for the section being labeled. This will make the section `\ref{}` commands in your document much easier to understand.
10. We are certainly thankful for the departmental and college support of our work. However, we do not explicitly thank either in our papers unless they’ve done something out of the ordinary. In our papers, we are a representative of the department and college, so thanking either is like thanking ourselves.
11. If you have questions about any of the points in this document, do *not* just ignore the point, ask about it.
12. If you don’t understand a change or revision to your paper that someone is suggesting, ask them about it; do *not* just ignore it.