

Journal Paper Instructions & Template for the RoboSub Competition

First A. TeamMember, Second B. TeamMember, and Third C. TeamMember

Abstract—This paper is both an instruction document and template to be used in preparation of RoboSub journal papers. The goals of the RoboSub journal paper are to assist teams in becoming more familiar with the preparation of scientific publications, to articulate the linkage between vehicle design tradeoffs and overall competition strategy, and to document successful approaches and lessons learned for future team members. If using Microsoft Word, text may be entered directly into this template; otherwise, authors should adhere to this instruction as close as possible. This template is based on the IEEE Transactions standard, and authors desiring to use LaTeX may retrieve similar style files from the IEEE website (www.ieee.org).

I. INTRODUCTION

The purpose of the RoboSub competition is to enhance the community of innovators capable of substantive contributions to the domain of autonomous unmanned underwater vehicles (UUVs). This enhancement is achieved by providing a venue and mechanism whereby the practitioners of the autonomous UUV community may form new connections and collaborations, increase their proficiency and inventiveness, and foster their passion for robotics and the underwater domain. While RoboSub has been an *autonomous* vehicle competition since its inception in 1998, there will be a continually increasing emphasis on autonomy going forward.

II. PAPER PREPARATION & STYLE GUIDELINES

Teams should download the Official Rules from the RoboSub website for due dates and submission instructions. The format of the journal paper shall adhere to the following guidelines, which are also utilized in this template document:

- 8.5 x 11 in. paper
- Double column style
- 10 page limit (excluding References & Appendix)
- Submitted in pdf format
- Margins ≥ 0.8 in.
- Header on every page including team name and page number
- Font: Times New Roman font using sizes as described in Table I

Most fields of study have their own styles while all scientific and technical writing follows similar guidelines. The style for the RoboSub journal paper follows the IEEE

Table I

FONT GUIDELINES.

THESE FONTS ARE INCLUDED AS STYLES IN THIS MS-WORD TEMPLATE.
NOTE THAT A TABLE CAPTION GOES ABOVE THE TABLE WHEREAS A FIGURE CAPTION GOES BELOW THE FIGURE.

Text Location	Font
Title	24 pt.
Author Names	10 pt.
Abstract	9 pt., bold
Heading, Level 1	10 pt., centered, small caps, Roman numbering
Heading, Level 2	10 pt. italic, capital letter numbering
Heading, Level 3	10 pt. italic, Arabic numbering
Body Text	10 pt.
Figure Caption	8 pt. below figure
Table Caption	8 pt., small caps above table
References	8 pt.

transactions paper template, which is typical for many fields of engineering. The full IEEE template is referenced in the Appendix, and those who have not published significantly or do not have English as a first language are encouraged to read this instruction in its entirety for general best practices in scientific writing. As a minimum set of guidelines, define abbreviations and acronyms the first time they are used, and use a zero before decimal points (*e.g.*, 0.5 rather than .5). Contractions should be avoided (*e.g.*, write “will not” vice “won’t”) and use the serial comma prior to the word “and” in a list (*e.g.*, x, y, and z). Italics should be used for emphasis rather than quotation marks (*e.g.*, do *this* and not “this”), and authors using common Latin abbreviations should clearly understand their meaning as their misuse confuses the reader. For example,

- “*e.g.*,” means “for example,”
- “*i.e.*,” means “that is,”
- “*cf.*” requests that the reader compare something you just said with what you’re about to say.

Note that in formal scientific writing words from foreign languages (whether abbreviated or not) should be italicized. A single “-” is a *hyphen* and is used to join two modifiers (without spaces) that would not make sense if used alone (*e.g.*, “a well-written sentence”) whereas two “-” are typically turned into a “—” by most word processors and constitutes a *dash*. The dash should not be used to replace the comma, and it should be used very sparingly in professional writing. Scientific writing should always utilize a third person (and preferably active voice) and avoid first or second person (*e.g.*, say “The sub is programmed to...” rather than “I/we programmed the sub

to...”).

Equations should be numbered consecutively, placed in line with text (using appropriate punctuation) as in

$$E = \frac{1}{2} \left\| \Sigma^{1/2} \mathbf{e} \right\|_2^2 = \frac{1}{2} \mathbf{e}^T \Sigma \mathbf{e}, \quad (1)$$

and cited using numerical reference (*e.g.*, “The result of (1) is that...”). Additionally, symbols should be explained immediately following the equation. Figures should also be referred to in line with text as in “The data in Fig 1 shows that...”, and they should appear in the document only after they have been referenced in the text.

III. PAPER CONTENTS

The journal paper consists of the following mandatory sections and two optional sections (Acknowledgements and Appendix). Additional sections may be included; however, the overall limit of 10 pages applies to all sections—the only exceptions are the References and Appendix.

A. Design Strategy

This section should discuss how the team generally plans on approaching the course and how the vehicle design relates to this approach. Additionally, teams should discuss how their design choices address the tradeoffs of reliability vs. complexity as well as capability vs. robustness. For example, teams have a limited number of working hours to prepare for the competition; this time could be spent adding additional capability or testing and improving the reliability of the existing capability. Equivalently, teams may choose to include increasingly sophisticated capability on their subs; however, additional sophistication (especially on underwater systems) represents additional failure points and often impacts reliability.

B. Vehicle Design

In the past, this section (*e.g.*, mechanical, electrical, and software) constituted the bulk of the journal paper and was often used by teams primarily to catalogue their component choices and resulting design. While the Journal Paper should still describe the design, RoboSub would like to encourage teams to increase emphasis on:

- Design processes and methodologies employed and their impact on component choices and design results
- Lessons learned from design iterations, testing evolutions, and/or experience at prior competitions. This should also include insight into designs, processes, or practices that did *not* work and should be avoided in the future
- Algorithmic descriptions or software approaches that the team has found to be particularly useful, impactful, or novel as well as any system engineering endeavors pursued by the team that should be continued or refined.

In short, the teams should consider the journal paper as not only an opportunity to practice scientific writing and

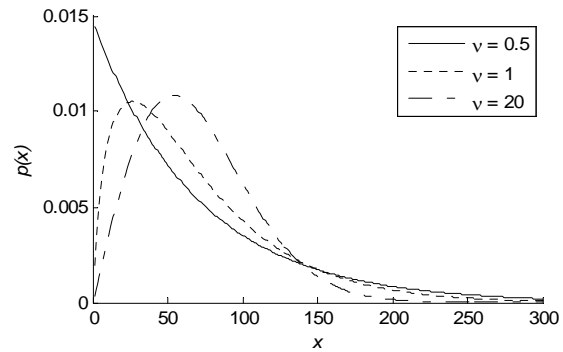


Fig 1. Both axes of a figure *must* be labeled and the caption should be used to explain why the figure is important to the reader (*i.e.*, do not simply use the caption to name the figure). Note that a figure caption goes below the figure whereas a table caption goes above the table.

advocate for their RoboSub entry, but they should also consider it a means to document and transfer knowledge to their future team members.

C. Experimental Results

This section should briefly describe how the team accomplishes testing (*e.g.*, in-water, simulation, etc.) and provide some notion of how much testing has occurred as of the journal paper submission. Note that the *actual results* reported in this section will not affect the team’s journal paper score (*e.g.*, reporting a large or small number of in-water hours will neither help nor hurt the journal paper score). This section should also discuss any studies, calculations, or estimates that the team has performed in the areas of reliability and robustness (*e.g.*, failure analysis, reliability modeling, etc.).

D. Acknowledgements (optional)

This is an optional section that teams may wish to utilize to acknowledge particular assistance, sponsors, etc.

E. References

As with any scientific publication, original ideas and content that are not generated by the paper’s authors should be properly cited. While there are several reference styles, the RoboSub journal paper uses the IEEE style, which is detailed in the Appendix. This style uses the bracketed reference, which should be used in line with text as in “The work in [x] states that...” This section does not count against the page limit.

F. Appendix—Outreach Activities (optional)

This Appendix is optional and also does not count against the page limit. Recall that a foundational purpose of RoboSub is to strengthen and enhance the community. Therefore, teams are encouraged to briefly summarize their educational outreach activities. The Appendix may also be used to include a team photo.

APPENDIX

This Appendix is taken from the IEEE Transactions template on the IEEE website, and should be followed for citing references

(<http://www.ieee.org/web/publications/authors/transjnl/index.html>).

Basic format for books:

- [1] J. K. Author, "Title of chapter in the book," in *Title of His Published Book*, xth ed. City of Publisher, Country if not
 [2] USA: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx-xxx.

Examples:

- [3] G. O. Young, "Synthetic structure of industrial plastics," in *Plastics*, 2nd ed., vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15-64.
 [4] W.-K. Chen, *Linear Networks and Systems*. Belmont, CA: Wadsworth, 1993, pp. 123-135.

Basic format for periodicals:

- [5] J. K. Author, "Name of paper," *Abbrev. Title of Periodical*, vol. x, no. x, pp. xxx-xxx, Abbrev. Month, year.

Examples:

- [6] J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," *IEEE Trans. Electron Devices*, vol. ED-11, no. 1, pp. 34-39, Jan. 1959.
 [7] E. P. Wigner, "Theory of traveling-wave optical laser," *Phys. Rev.*, vol. 134, pp. A635-A646, Dec. 1965.
 [8] E. H. Miller, "A note on reflector arrays," *IEEE Trans. Antennas Propagat.*, to be published.

Basic format for reports:

- [9] J. K. Author, "Title of report," Abbrev. Name of Co., City of Co., Abbrev. State, Rep. xxx, year.

Examples:

- [10] E. E. Reber, R. L. Michell, and C. J. Carter, "Oxygen absorption in the earth's atmosphere," Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1988.
 [11] J. H. Davis and J. R. Cogdell, "Calibration program for the 16-foot antenna," Elect. Eng. Res. Lab., Univ. Texas, Austin, Tech. Memo. NGL-006-69-3, Nov. 15, 1987.

Basic format for handbooks:

- [12] *Name of Manual/Handbook*, x ed., Abbrev. Name of Co., City of Co., Abbrev. State, year, pp. xxx-xxx.

Examples:

- [13] *Transmission Systems for Communications*, 3rd ed., Western Electric Co., Winston-Salem, NC, 1985, pp. 44-60.
 [14] *Motorola Semiconductor Data Manual*, Motorola Semiconductor Products Inc., Phoenix, AZ, 1989.

Basic format for books (when available online):

- [15] Author. (year, month day). *Title*. (edition) [Type of medium]. *volume (issue)*. Available: site/path/file

Example:

- [16] J. Jones. (1991, May 10). *Networks*. (2nd ed.) [Online]. Available: <http://www.atm.com>

Basic format for journals (when available online):

- [17] Author. (year, month). *Title. Journal*. [Type of medium]. *volume (issue)*, pages. Available: site/path/file

Example:

- [18] R. J. Vidmar. (1992, Aug.). On the use of atmospheric plasmas as electromagnetic reflectors. *IEEE Trans. Plasma Sci.* [Online]. 21(3), pp. 876-880. Available: <http://www.halcyon.com/pub/journals/21ps03-vidmar>

Basic format for papers presented at conferences (when**available online):**

- [19] Author. (year, month). *Title*. Presented at Conference title. [Type of Medium]. Available: site/path/file

Example:

- [20] PROCESS Corp., MA. Intranets: Internet technologies deployed behind the firewall for corporate productivity. Presented at INET96 Annual Meeting. [Online]. Available: <http://home.process.com/Intranets/wp2.htm>

Basic format for reports and handbooks (when available online):

- [21] Author. (year, month). *Title*. Company. City, State or Country. [Type of Medium]. Available: site/path/file

Example:

- [22] S. L. Talleen. (1996, Apr.). The Intranet Architecture: Managing information in the new paradigm. Amdahl Corp., CA. [Online]. Available: <http://www.amdahl.com/doc/products/bsg/intra/infra/html>

Basic format for computer programs and electronic documents (when available online): ISO recommends that capitalization follow the accepted practice for the language or script in which the information is given.**Example:**

- [23] A. Harriman. (1993, June). Compendium of genealogical software. *Humanist*. [Online]. Available e-mail: HUMANIST@NYVM.ORG Message: get GENEALOGY REPORT

Basic format for patents (when available online):

- [24] Name of the invention, by inventor's name. (year, month day). *Patent Number* [Type of medium]. Available: site/path/file

Example:

- [25] Musical toothbrush with adjustable neck and mirror, by L.M.R. Brooks. (1992, May 19). *Patent D 326 189* [Online]. Available: NEXIS Library: LEXPAT File: DESIGN

Basic format for conference proceedings (published):

- [26] J. K. Author, "Title of paper," in *Abbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), year, pp. xxxxxx.

Example:

- [27] D. B. Payne and J. R. Stern, "Wavelength-switched passively coupled single-mode optical network," in *Proc. IOOC-ECOC*, 1985, pp. 585-590.

Example for papers presented at conferences (unpublished):

- [28] D. Ebehard and E. Voges, "Digital single sideband detection for interferometric sensors," presented at the 2nd Int. Conf. Optical Fiber Sensors, Stuttgart, Germany, Jan. 2-5, 1984.

Basic format for patents:

- [29] J. K. Author, "Title of patent," U.S. Patent x xxx xxx, Abbrev. Month, day, year.

Example:

- [30] G. Brandli and M. Dick, "Alternating current fed power supply," U.S. Patent 4 084 217, Nov. 4, 1978.

Basic format for theses (M.S.) and dissertations (Ph.D.):

- [31] J. K. Author, "Title of thesis," M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.
 [32] J. K. Author, "Title of dissertation," Ph.D. dissertation, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

Examples:

- [33] J. O. Williams, "Narrow-band analyzer," Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993.
 [34] N. Kawasaki, "Parametric study of thermal and chemical nonequilibrium nozzle flow," M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.

Basic format for the most common types of unpublished references:

- [35] J. K. Author, private communication, Abbrev. Month, year.
- [36] J. K. Author, "Title of paper," unpublished.
- [37] J. K. Author, "Title of paper," to be published.

Examples:

- [38] A. Harrison, private communication, May 1995.
- [39] B. Smith, "An approach to graphs of linear forms," unpublished.

- [40] A. Brahms, "Representation error for real numbers in binary computer arithmetic," IEEE Computer Group Repository, Paper R-67-85.

Basic format for standards:

- [41] *Title of Standard*, Standard number, date.

Examples:

- [42] IEEE Criteria for Class IE Electric Systems, IEEE Standard 308, 1969.
- [43] Letter Symbols for Quantities, ANSI Standard Y10.5-1968.