Technical Design Report Instructions

2018 RoboSub *www.robosub.org*

Paper Preparation Overview:

Teams should download the Official Rules for due dates and submission instructions. The format of the written paper shall adhere to the following guidelines:

- **5 page limit** (excluding References and Appendices)
- 8.5 x 11 in. page size
- Margins ≥ 0.8 in.
- Font: Times New Roman 12pt
- Header on every page including team name and page number
- Submitted in pdf format

Paper Contents

The written paper consists of six mandatory Sections and one mandatory Appendix. Additional sections may be included; however, the overall limit of 5 pages applies (excluding References and Appendices). In general, the editorial style for IEEE Transactions should be followed: https://www.ieee.org/conferences/publishing/templates.html. The two-column format is optional. If you wish to refine the use of English in your paper (encouraged), please collaborate with colleagues at your institution or on the event forum. Professional editing services are also available: secure.aje.com/en/default/submitb/select.

1. Abstract

The abstract is a short summary of the main points in the paper. The paper should primarily describe the linkage between your overall competition strategy and your system architecture, design and engineering decisions.

2. Competition Strategy

This section should discuss how the team plans on approaching the course and how the vehicle design relates to this approach. The course consists of multiple tasks with associated points for accomplishment. The only required task is passing through the start gate. Other tasks are optional and can be attempted in any order. The more tasks a vehicle is designed and engineered to accomplish, the more complex the overall vehicle system will be. The discussion should include the team's consideration of the trade-offs between system complexity and reliability. For example, teams have a limited number of working hours to prepare for the competition; this time could be spent adding additional capabilities or testing and improving the reliability of an existing capability. As system complexity grows, changes in subsystems can propagate in unmanageable ways when time is limited. Clearly, the goal of a competition is to score more points than the other teams. There are many ways to do this. Studying past competitions may be instructive. Based on history and the system engineering talents of your current team, describe your strategic vision.

3. Design Creativity

Given your strategy for winning and your approach to managing complexity, describe the creative aspects of your system. Novelty may occur at component, subsystem, and/or integrated system levels. Describe your experience in making both architectural/design decisions and system engineering decisions. This section should **not** include detailed component descriptions and/or specifications not of original design. The latter should be described in Appendix A.

4. Experimental Results

This section should describe various tests accomplished to date and planned, both in-water and in simulation, including pre-qualifying runs. There is a strong correlation between in-water testing time and competitive performance in the arena. Given typical student time constraints, balancing creative design and system engineering with testing and experimentation can be a challenge. How did your team estimate the amount of testing required to meet your reliability goals? How did you balance the demands of design and engineering with those of testing and experimentation?

5. Acknowledgements

Participating in the competition, as in all research projects, involves marshalling resources and support beyond the efforts of individual team members. This support can take many forms. Acknowledging those who have underwritten your efforts is important.

6. References

As with any technical publication, original ideas and content not generated by the paper's authors should be properly cited. While there are many citation styles, the IEEE Conference Proceedings style should be used, found on the following link: www.ieee.org/conferences/publishing/templates.html.

Appendix A: Component Specifications

In the past, detailed descriptions of components constituted the bulk of many written paper submissions. Such detail often distracts from understanding the team's underlying strategic thinking, design and engineering decisions, or novel contributions. Teams should list only the components actually used in the vehicle in the table below. This standardized table will help document and track trends in component (hardware and software) usage and team metrics.

Component	Vendor	Model /Type	Specs	Cost (if new)
Buoyancy Control				
Frame				
Waterproof Housing				
Waterproof Connectors				
Thrusters				
Motor Control				
High Level Control				
Actuators				
Propellers				
Battery				
Converter				
Regulator				
CPU				
Internal Comm Network				
External Comm Innterface				
Programming Language 1				
Programming Language 2				
Compass				
Inertial Measurment Unit (IMU)				
Doppler Velocity Log (DVL)				
Camera(s)				
Hydrophones				
Manipulator				
Algorithms: vision				
Algorithms: acoustics				
Algorithms: localization and mapping				
Algorithms: autonomy				
Open source software				
Team size (number of people)				
HW/SW expertise ratio				
Testing time: simulation				
Testing time: in-water				

Appendix B: Outreach Activities (optional)

A foundational purpose of RoboSub has been to strengthen and enhance the community. Teams are encouraged to participate in educational outreach activities and describe those activities here. The static judging score includes points for educational outreach on all levels.