

## General Guidelines for Robotics Papers using Experiments

John Hallam

Our behavior in reviewing manuscripts is a manifestation of the values that we hold as members of the community of scholars. This document provides questions designed to help reviewers produce high quality reviews and in the process improve the standard of robotics papers internationally.

Robotics papers come in many varieties, not all of which are overtly experimental. For example, a paper may present a new theoretical advance; it may describe a new system concept; it may advance an argument based on discussion; it may provide extra characterisation of a known system; it may do more than one of the foregoing.

However, most forms of evaluation, comparison, characterisation... involve at least basic experimentation, and should be carried out responsibly.

### 1. **Is it an experimental paper?**

An **experimental paper** is one for which results, discussion and/or conclusions depend crucially on experimental work. It uses experimental methods to answer a significant engineering or scientific question about a robotic (or robotics-related) system. To test whether a paper is experimental, consider whether the paper would be acceptable without the experimental work: if the answer is no, the paper is experimental in the context of this discussion.

Note that experiments may be conducted using simulation as a tool.

### 2. **Are the system assumptions/hypotheses clear?**

The assumptions or hypotheses necessary to the function of the system must be clearly stated. System limits must be identified.

### 3. **Are the evaluation criteria spelled out explicitly?**

An experimental paper should address an interesting engineering (or scientific) question. Such questions will generally concern the relationship between system or environment parameters and system performance metrics. The performance metrics being studied must be clearly and explicitly motivated, and the parameters or factors on which they depend must be identified.

The criteria for “success” should be stated and, where necessary, justified.

### 4. **What is being measured and how?**

The performance criteria being studied must be measurable; the paper must identify measurements corresponding to each criterion and motivate the choice of measurements employed. The data types of measurements should be clearly given or obvious — categorical (e.g. yes/no), ordinal (e.g. rankings), or numerical.

**5. Do the methods and measurements match the criteria?**

Measurement methods and choices must be clearly and explicitly described and, where appropriate, explained and justified. The paper must demonstrate (unless it is self-evident) that the chosen measurements actually measure the desired criteria and that the chosen measurement procedures generate correct data (for example, that implementations are plausibly correct).

**6. Is there enough information to reproduce the work?**

It is fundamental to scientific experimentation that someone else can in principle repeat the work. The paper must contain a complete description of all methods and parameter settings, or point clearly to an accessible copy of that information (which should be supplied to the paper's reviewers). Known standard methods need not be described, but any variations in their application must be noted. If benchmark procedures are used, they must be referenced, and any variations from the standard benchmark must be documented and justified.

**7. Do the results obtained give a fair and realistic picture of the system being studied?**

Care must be taken to ensure that experiments are properly executed: factors affecting measured performance that are not the subject of study must be identified and controlled for. In particular, uncontrolled variations in the system or the environment must be identified and dealt with by elimination, grouping techniques or appropriate statistical methods. The task tackled by the system must neither be too easy or too hard for the system being studied. Outlying measurement data may not be eliminated from analysis without justification and discussion.

**8. Are the drawn conclusions precise and valid?**

The experimental conclusions must be consistent with the experimental question(s) the paper poses, the criteria employed and the results obtained. System limits must be presented or discussed as well as conditions of successful operation. Conclusions should be stated precisely. Those drawn from statistical analysis must be consistent with the statistical information presented with the results.