

Technological Study of the Robot Operating System

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Introduction

Since the Robot Operating System is now the standard framework for robotics software, it is expected that most commercial robots will include at least one ROS package in the near future. Software for robotics should be based on solid software engineering principles for high quality. In this paper, we conduct a methodical mapping study on a number of works in software engineering on ROS that have been published in the most prestigious venues for software engineering and robotics. The relevance of this cutting-edge research to the robotics software industry will be the subject of our investigation and evaluation. A stringent selection procedure is used to select the potentially relevant studies. As a result, a set of primary research on ROS in software engineering has been conducted. The primary studies are then qualitatively analyzed using a classification framework that is clearly defined. Researchers and practitioners alike will be interested in the findings: (i) We present an up-to-date overview of software engineering research on ROS and its potential for industrial adoption, ii) a comprehensive discussion of the research field as a whole, and iii) suggestions for improving the alignment of research and industry.

Discussion

The purpose of this work is to evaluate the potential for industrial adoption of the software engineering aspects of ROS that are the focus of the numerous scientific studies that have been published on the topic of ROS. In order to accomplish this, we map scientific research on software engineering for ROS in a methodical manner. We start with a selection of ROS-related studies that were published in top robotics and software engineering journals. We keep a set of studies and use a snowballing method to uncover additional related studies in other venues after following a stringent procedure that was defined a priori. As a result, there are linked studies in which only studies on software engineering for ROS were selected using the same a priori procedure, resulting in a total of primary studies to be analyzed. All primary studies are then qualitatively analyzed by a team of researchers using a well-defined classification framework to combine the extracted data and arrive at the main conclusions.

Support for actual physical systems is an important feature of IIIE. Provide an illustration of how integrating information from multiple disciplines can simplify and enhance aircraft analysis. The process of integrating information is broken down into three main ideas in the paper: the physical field based on geometry, the field-state iteration, and pipeline operators. Physical parameters from various dimensional geometries are exchanged through deliberate interaction between these components, resulting in real-time multi-physical field coupling. In contrast, we propose a motion estimation technique that serves as a foundation for IIIE and can help industrial vision systems become

more intelligent. More specifically, the information about a machine's motion that is gleaned from the proposed approach can easily be used as a guide for gaining a deeper comprehension of its operational state. Additionally, the estimated motion information can be used as a feedback signal for an algorithm like reinforcement learning in a control automation system that incorporates the extracted data [1-5].

Conclusion

It is understandable that new solutions are being proposed considering the ROS ecosystem's recent development. However, a thorough validation in a research setting accompanies the solution proposal of primary studies. Evaluation studies, on the other hand, look at various aspects of the ROS ecosystem and evaluate proposed approaches and solutions. A sign of the ecosystem's maturity is the presence of such studies. For instance, a primary study examines ROS's dependency bugs (P5), best architectural practices (P8), and robotics software architecting practices (S13) in a primary study. Finally, there are no opinion or personal experience primary studies to be found. Only philosophical primary studies offer thoughts on ROS's present and future.

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