Verification of Robot Controller for Evaluating Impacts of Faults in Electro-mechanical Systems

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Abstract

The aim of the presentation is to introduce a new platform under development for testing fault-tolerance methodologies based on FPGAs which applies the technique of functional verification. Functional verification is a modern approach to verifying that digital system complies with its specification. Verification environment for functional verification of robot controller which searches path for the robot through maze is presented in this presentation. This verification environment is designed according to the UVM (Universal Verification Methodology) principles. As an interesting feature of the verification environment we see the use of mechanical part (robot in a maze) simulation.

In several areas, such as aerospace and space applications or automotive safety-critical applications, fault tolerant electro-mechanical (EM) systems are highly desirable. In these systems, the mechanical part is controlled by its electronic controller. Currently, a trend is to add even more electronics into EM systems. The presentation describes the use of the verification environment for evaluating impacts of faults in electro-mechanical systems. It will serve as a tool for automating fault tolerance evaluation of electro-mechanical systems and together with the fault injector will form the basis of the verification platform in the future. The experimental results gained from the verification process are also presented in the presentation.

Paper origin

The research is also summarized in the paper published in the Microprocessors and Microsystems journal [1]. Actual work is summarized in paper submitted to DSD 2016 [2]

Acknowledgment

This work was supported by The Ministry of Education, Youth and Sports from the National Programme of Sustainability (NPU II); project IT4Innovations excellence in science - LQ1602. This work was also supported by Brno University of Technology under number FIT-S-14-2297 and by ARTEMIS JU under grant agreement no 641439 (ALMARVI).

References

[1] Podivinsky, J., Cekan, O., Simkova, M., Kotasek, Z.: The Evaluation Platform for Testing Fault-tolerance Methodologies in Electro-mechanical Applications, Microprocessors and Microsystems, 2015, vol. 39, no. 8, pp. 1215-1230. ISSN 0141-9331.

[2] Podivinsky, J., Cekan, O., Lojda, J., Kotasek, Z.: Verification of Robot Controller for Evaluating Impacts of Faults in Electro-mechanical Systems. In: 19th Euromicro Conference on Digital Systems Design. Lymassol, 2016.