

Interactive Computing Systems Reliability Analysis

PHD RESEARCH THEME PROPOSAL

CENTRO DE CIÊNCIAS E TECNOLOGIAS DA COMPUTAÇÃO, UNIVERSIDADE DO MINHO

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This research theme follows from an ongoing effort to develop tools and techniques for the systematic analysis of interactive systems' designs. Applying formal techniques to analyse interactive systems makes possible such a systematic approach to the evaluation of the usability of a new design. Formal techniques can provide an incisive analysis that is effective in uncovering potential unforeseen interaction problems [3]. These potential problems, once uncovered, can be explored from a usability perspective. A verification tool has already been developed (the IVY workbench), that supports a modelling, verification, and analysis cycle. Verification is achieved through model checking. Work on the IVY workbench is a joint effort between Minho and Prof. Michael Harrison (currently at Newcastle).

The basic building blocks of the verification approach have been defined, and tool support developed [1, 2]. A number of realistic case studies have been carried out. In general these fell under the category of what might be called *control panel interfaces* (c.f. the flight control panel of an aircraft, or the air-conditioning control panel of a car). The goal of the current proposal is to broaden the scope of the approach. We are interested in highly moded interfaces, which pose particular challenges in terms of modelling, and in exploring how the approach can be applied in large-scale complex interactive computing applications. A number of possible application areas have been identified which include software for medical devices, and software for the aerospace industry.

The ideal candidate will have an interest/skills in (by decreasing order or relevance): formal methods (in particular, model checking), human-computer interaction, and Java and/or JavaScript programming. The successful candidate should be available to travel abroad to discuss the work and its applicability with research partners.

Funding for the first to second years of the project is secured. A research proposal and/or PhD grant application will be submitted in due course to guarantee the remaining funds.

References

- [1] J. C. Campos and M. D. Harrison. Systematic analysis of control panel interfaces using formal tools. In *Interactive Systems: Design, Specification and Verification*, volume 5136 of *Lecture Notes in Computer Science*, pages 72–85. Springer-Verlag, July 2008.
- [2] J. C. Campos and M. D. Harrison. Interaction engineering using the IVY tool. In *ACM Symposium on Engineering Interactive Computing Systems (EICS 2009)*, pages 35–44. ACM, 2009.
- [3] M. D. Harrison, J. C. Campos, and K. Loer. Formal analysis of interactive systems: opportunities and weaknesses. In P. Cairns and A. Cox, editors, *Research Methods in Human Computer Interaction*, chapter 5. Cambridge University Press, 2008.