

Verified Mobile Code Repository in the Intelligent Space

Máté Tejfel, Zoltán Istenes and László A. Jeni

The Intelligent Space (iSpace) [6] is a space (room or corridor) containing several communicating Distributed Intelligent Network Devices (DINDs) which share their information about a human environment. A DIND consists of three basic elements, the sensor to monitor the dynamic environment of the DIND (which contains people, vehicles and robots, etc.), the processor (computer) to process the captured information and the communication device to provide the cooperation of different DINDs through a network. The iSpace also contains mobile robots which handle real objects in the human environment to support the people in it. The mobile robots can be controlled with mobile code technology, by dynamically downloading on the robots the tasks needed to be executed by them. In some earlier work the concept how the safe mobile code technology can be applied in the case of mobile robots and how it integrated into the iSpace environment was introduced [2, 3, 4, 5]. In this model the mobile code is created, verified, stored and transmitted to the robot using the CPPCC architecture [1]. Robots contain explicit and formally expressed security requirements (for example that each task has to be started from, and stop in a given state or the robot may not go to dangerous places, lift, stairway etc.). A formal verification system can verify the mobile code properties correspondence against the robots requirements. The robot refuses to execute those mobile code tasks violating its requirements. For the execution of the correspondence analysis formally verified properties of the mobile code have to be attached to the mobile code. This paper describes a method for formalisation and verification of properties of mobile code and provides a repository of mobile codes with attached verified properties.

Acknowledgements

This work was supported by Ferenc Deák scholarship.

References

- [1] Horváth, Z., Kozsik, T. Safe mobile code - CPPCC: Certified Proved- Property-Carrying Code. G. Czajkowski and J. Vitek, *Resource Management for Safe Languages (in: ECOOP 2002 Workshop Reader, LNCS 2548/2002, Springer-Verlag)*, 2002, pp. 8-10.
- [2] Istenes, Z., Kozsik, T., Hoch, Cs., Tóth, L. A. Proving the correctness of mobile Java code, *6th Joint Conf. on Math. and Comp. Sci.*, July 12-15., 2006, Pécs, Hungary, accepted to *Pure Mathematics and Applications*, SAAS Ltd.-SAAS Publishing, Budapest, Hungary, Vol. 17 (2006), No. 3-4,.
- [3] Istenes, Z., Kozsik, T. Commanding a robot in a safe way *Proceedings of the 10th Symposium on Programming Languages and Software Tools (SPLST 2007)*, Budapest, 2007, pp. 167-177., ISBN 978 963 463 925 1
- [4] Jeni, L. A., Istenes Z., Korondi, P., Hashimoto H. Hierarchical Reinforcement Learning for Mobile Robot Navigation using the iSpace Concept, *11th IEEE International Conference on Intelligent Engineering Systems*, 2007.
- [5] Jeni, L. A., Istenes Z., Tejfel M. Safe Mobile Code in the Intelligent Space, Submitted to *Proceedings of the 2nd Symposium of Intelligent Systems (IRFIX 2007)*, Budapest, 2007
- [6] Lee, J.-H., Hashimoto, H. Intelligent Space - concept and contents, *Journal of Advanced Robotics*, Brill Academic Publishers, Vol. 16, Number 3, May, 2002, pp. 265-280.