Research Activities of Embedded Group Laboratory at University of Naples

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I. Extended Abstract

The research group of embedded systems at University of Naples Federico II is currently composed of six professors and researchers and of more than 10 post-doctoral researchers and Ph.D. students. The group is one of the 20 research groups of the Department of Electrical Engineering and Information Technologies, which has more than 120 full time academics and more than 50 researchers. Here listed, the main research activities of the group.

A. Hardware security and Trust

Security is one of the most critical aspects for embedded systems that are deployed in unattended environments, since many physical attacks can be successfully used to extract sensitive information, to violate intellectual property or to cause damage through a privilege escalation attack. We are working on two different tracks: the former involves classical approaches, based on cryptography and security standards [1]; the latter investigates new protocols, which exploits Physical Unclonable Functions, to guarantee security properties [2].

B. Knowledge Engineering and Semantic

Our research group is focusing on application of information processing and semantic management of data in many complex fields like E-government, E-health or Online Social Network Analysis.

In particular, we are currently active in two application fields: the first one concerns information processing for Law Enforcement Systems, in the EU funded project with action grant 2016 of Justice Programme, JUST-JACC-EJU-AG-2016, 766463. The second field focuses on Online Social Network Analysis. We exploit Artificial Intelligence techniques on the domain of the Law Enforcement Systems. In order to deal with massive volume of data and low latency required by such applications, we are investigating the role of special purpose embedded systems that are able to speed-up the classification process [3], [4].

C. Model-Driven in Embedded System

A research direction investigates the usage of model-driven approaches and formal modeling for verification and validation of critical embedded control systems. Formal models are exploited for availability and performability evaluation, as well as for automatic generation of test cases in model-based testing.As for the automatic generation of test cases, this research is part of the work conducted within the recent ARTEMIS Joint Undertaking project CRYSTAL (CRitical sYSTem engineering AcceLeration). Our work focused on the development of an interoperable testing environment for ERTMS/ETCS control systems [5]. A new state-based language, Dynamic State Machines (DSTMs), has been defined in order to cope with the specific modeling requirements to be met in the testing process of railway controllers [6], [7]. The test cases are obtained by exploiting the capability of a model checker to extract counterexamples for violated properties, so DSTM specifications of the system under test are mapped to Promela models [8], [7] in order to achieve automated generation of test cases by model checking and Spin.

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