Abstract:

As embedded systems become increasingly complex, it is important that there be adequate modernization of relevant design and testing methodologies to ensure efficient scalability and maintenance of such systems. Embedded systems have indeed come a long way since the simple scheduling and control algorithms of long ago. The term has now come to embody not only individual offline programs, but also fully connected and intelligent distributed systems as well. Most recently, the design challenges of systems that are self-adaptive and evolving, have increased the need for further research aimed at constructing a new paradigm of best practices in design and testing the intelligent embedded systems.

The challenges presented by embedded systems, particularly those that are self-adaptive, are vast. Self-adaptive embedded systems are the current trending topic. In [1], they outline the benefits and complexities of truly flexible and adaptive systems. In [6], they lament the unfortunate lack of a universally accepted modeling paradigm for embedded system design. This is because embedded systems often have their own unique requirements, which may favor one modeling approach over another. Furthermore, in [4] they say, “Model Driven Development (MDD) is considered as the next paradigm shift to address the increasing complexity in embedded software development.”

It is emerging, however, that the most challenging problem related to intelligent embedded system design revolves around the choices made during the initial system design phase, which ultimately complicate system testing. For example, in [4], they explain that the challenges of testing can often be attributed to inflexible choices made during the system design. That is to say, intelligent embedded systems are often expected to change their behavior to adapt to a changing environment, which makes it more complicate for system testing and even at initial system design phase. Such environments may be truly unforeseen and unpredictable. It is extremely difficult to design and consequently test for all possible internal modifications of these kind of systems.

We intend to focus our research efforts on effective modeling for evolving environments and intelligent systems. As a corollary, it will be necessary to discuss the design and testing complications of such a system.
Five Main References:

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5. Aêda Sousa; Tarcísio Couto; Celso Agra; Fernanda Alencar “Use of Ontologies in Embedded Systems: A Systemic Mapping”. In 2016 10th International Conference on the Quality of Information and Communications Technology (QUATIC)

Other Reference:

1. Brendan Burns and David Oppenheimer, Google “Design Patterns for Container-Based Distributed Systems” 8th USENIX Workshop on Hot Topics in Cloud Computing (HotCloud 16), 2016