

Panel

Embedded Systems Education: How to Teach the Required Skills?

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Abstract

The goal of this panel is to contrast existing approaches to embedded system education with the needs in industry.

1. Introduction

Embedded system design is currently not yet well represented in academic programs. The general trend toward embedded systems requires a drastic change of that situation. This panel aims at starting a discussion on how current curricula should be revised in order to take the requirements of modern technologies into account.

2. Academic views

Academic panel members present their views on embedded system education. These views include those on traditional education programs as well as those on graduate programs, some of which are run in cooperation with industrial partners. Approaches aiming at removing the wall between EE and CS education are presented.

In particular, an approach integrating embedded systems education into the curriculum for undergraduates is proposed [1]. The approach takes typical common structures of undergraduate education into account.

Furthermore, the key ideas of the education at the Advanced Learning and Research Institute (ALARI) in Lugano (Switzerland) are presented [2]. These include a joint Master's program on embedded systems and a tight integration between industry and academia, also proposed in other programs.

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Views of the panel members also reflect drastic views on how the curricula should be reorganized, taking the changes in the technology in the recent years into account. After such a reorganization, hardware and software should be taught in the same courses, including principles, algorithms, design techniques, and systems of computation and communication [3].

3. Industrial Views

Industrial panel members come from different communities, including those with a focus on multimedia and ambient intelligence and those with a focus more on safety-critical systems such as automotive systems. Industrial panel members will present their requirements for embedded system education.

One set of requirements is coming from the design of safety-critical systems. These requirements are frequently not considered in the current curricula. They have a very substantial impact on the courses that are required. Also they have a large impact on the required skills for using formal methods. Such skills should be obtained during the education in academia, since this may be a time-consuming process.

Another set of requirements is coming from the design of highly complex multimedia systems. Modern multimedia applications consist of source and channel coding, advanced compression techniques, audio, video, and graphics streaming, intelligent user interfaces, and they will contain many more we cannot even think of yet. These applications are implemented by means of heterogeneous embedded multiprocessors systems. These systems require a proper hardware and software architecture in order to be flexible enough to support future applications. What kind of skills do people need for this? Since single individuals cannot comprehend the details of all of this, it is proposed to identify different roles in such a way that people can cooperate. According to that proposal, there should be the application developer who defines the functionality of a system. Then there should be the role of the system architect who integrates and maps the

functionality on a platform. Furthermore there would be the role of the platform architect who designs the architecture of a platform. Finally, there would be the role of the component designer who implements components of a platform. The application developer should shield the system architect from too much application details. The platform architect should provide a high-level programming interface for his platform to allow the system architect to easily integrate and map the functionality into communicating hardware and software components.

4. Conclusion

The academic system is faced with the need to update its education in embedded system design. Otherwise, it will become

increasingly difficult to design tomorrow's complex embedded systems. This process requires a tight interaction with industry in order to provide the right focus.

5. REFERENCES

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