

Position for a PhD student

Self-adaptive component-based embedded software

Advisors

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Context: Embedded Systems for Transport

The context of this PhD is the ongoing collaboration between the LAMIH lab from UVHC and the research lab IA of the EMD. This work aims at addressing issues related to autonomous transportation systems. Computational systems dedicated to transport are intrinsically distributed involving a variety of infrastructures, heterogeneous vehicle fleets, and various mobile stakeholders (users, operators, managers). In order to deal with even more information and increased interaction while keeping the system easily manageable, some tasks need to be delegated to software embedded into the machines involved. This requires enabling the devices' autonomy and their ability to self-organize.

The application domain requires to make softwares aware of the environment and able to adapt. For example, transport systems should be able to distribute services, on the fly, according to the users' mobility. Furthermore, these systems should be able to reconfigure themselves according to the available resources. It is also worth noting that, developing such information systems requires building software embedded into mobile devices with limited resources.

Objective: Adaptation in embedded systems

The study to be conducted in this PhD concerns self-adaptive software for embedded systems. Adaptation is the modification of a software in order to conform to new functioning conditions [LBB⁺01, Sen03, Ket04]. Self-adaptation refers to changes performed, at run-time, by the system itself in order to take into consideration changes of its logical or physical environment.

We focus on approaches based on software components [SGM02] which allow to reuse pieces of code that were previously tested and streamlined. In this context, software adaptation translates into operations of addition, removal and parameterization of components and their connexions.

The research to be conducted is a follow-up to our previous work [GBV08, GBV06] that unifies the assembly and the adaptation of component-based software. The goal of this study is to address issues related to dynamic adaptation in the context of embedded systems. Particularly, adaptation resources consumption need to be bounded in order to fit constraints related to the application domain and targeted platforms. This raises several issues such as the availability of services provided by the adapted application and the quality of adaptation decisions.

In order to validate theoretical results, the PhD student will have to conduct experiments. Several wireless devices are available for this purpose, including PDAs and mobile robots such WifiBot [BDS⁺08].

References

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