In order to satisfy the needs of their customers, traditional manufacturers of large mechatronics products need to transform them into software products which are constantly updated with new functionalities. For example, software plays an important role in almost every functionality of a modern car, such as adaptive cruise control and GPS navigation, where parts of it are soon expected to be updated regularly over the air.

Adding new software functionalities to large complex systems, such as the ones running in vehicles and airplanes, often relies on the use of new features in the general architecture of the system. For example, wireless communication between the car and the outside world. Using these new architectural features in the system, however, is usually a costly operation affecting a number of artifacts in the development process, including architectural models and system design tools.

In this theses, we address the problem of efficient management of the evolution of large software systems and their architectures. We achieved this by developing methods and software tools which are able to automatically assess the impact of supporting a particular architectural feature on the main artifacts in the development process. The use of our methods has a potential to significantly increase the speed of innovation in large development projects, and reduce their cost.

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