Instrumented Sensor System Architecture

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Abstract

Sensor systems are becoming ubiquitous throughout society, yet their design, construction and operation are still more of an art than a science. In this paper, we define, develop, and apply a formal semantics for sensor systems that provides a theoretical framework for an integrated software architecture for modeling sensor-based control systems. Our goal is to develop a design framework which allows the user to model, analyze and experiment with different versions of a sensor system. This includes the ability to build and modify multisensor systems and to monitor and debug both the output of the system and the affect of any modification in terms of robustness, efficiency, and error measures. The notion of *Instrumented Logical Sensor Systems* (ILSS) that are derived from this modeling and design methodology is introduced. The instrumented sensor approach is based on a sensori-computational model which defines the components of the sensor system in terms of their functionality, accuracy, robustness and efficiency. This approach provides a uniform specification language to define sensor systems as a composition of smaller, predefined components. From a software engineering standpoint, this addresses the issues of modularity, reusability, and reliability for building complex systems. An example is given which compares vision and sonar techniques for the recovery of wall pose.