Run-time safety monitoring framework for AI-based systems: automated driving cases

ABSTRACT

Intelligent systems based on artificial intelligence techniques are increasing and are recently being accepted in the automotive domain. In the competition of automobile makers to provide fully automated vehicles, it is perceived that artificial intelligence will profoundly influence the automotive electric and electronic architecture in the future. However, while such systems provide highly advanced functions, safety risk increases as AI-based systems may produce uncertain output and behaviour. In this paper, we devise a run-time safety monitoring framework for AI-based intelligence systems focusing on autonomous driving functions. In detail, this paper describes (i) the characteristics of a safety monitoring framework; (ii) the safety monitoring framework itself, and (iii) we develop a prototype and implement the framework for two critical driving functions: Lane detection and object detection. Through an implementation of the framework to a prototypic control environment, we show the possibility of this framework in the real context. Finally, we discuss the techniques used in developing the safety monitoring framework and describes the encountered challenges.

Keyword: System safety; Run-time safety monitoring; Autonomous driving; Artificial intelligence