

Chapter 27

Automatic Static Software Testing Technology for Railway Signaling System

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ABSTRACT

In accordance with the development of recent computer technology, the railway system is advancing to be flexible, automatic and intelligent. In addition, many functions of railway signaling which are cores to the railway system are being operated by computer software. Recently, the dependency of railway signaling systems on computer software is increasing. The testing to validate the safety of the railway signaling system software is becoming more important, and related international standards for inspections on the static analysis based source code and dynamic test are a highly recommended (HR) level. For this purpose, studies in relation to the development of source code analysis tools were started several years ago in Korea. To verify the applicability of validation tools developed as a part of these studies, the applicability test was performed for the railway signaling system being applied to the Korean domestic railway. This automated testing tool for railway signaling systems can also be utilized at the assessment stage for railway signaling system software, and it is anticipated that it can also be utilized usefully at the software development stage. This chapter drew the result of the application test for this actual source code of the railway signaling system being applied to railway sites and analyzed its result.

1. INTRODUCTION

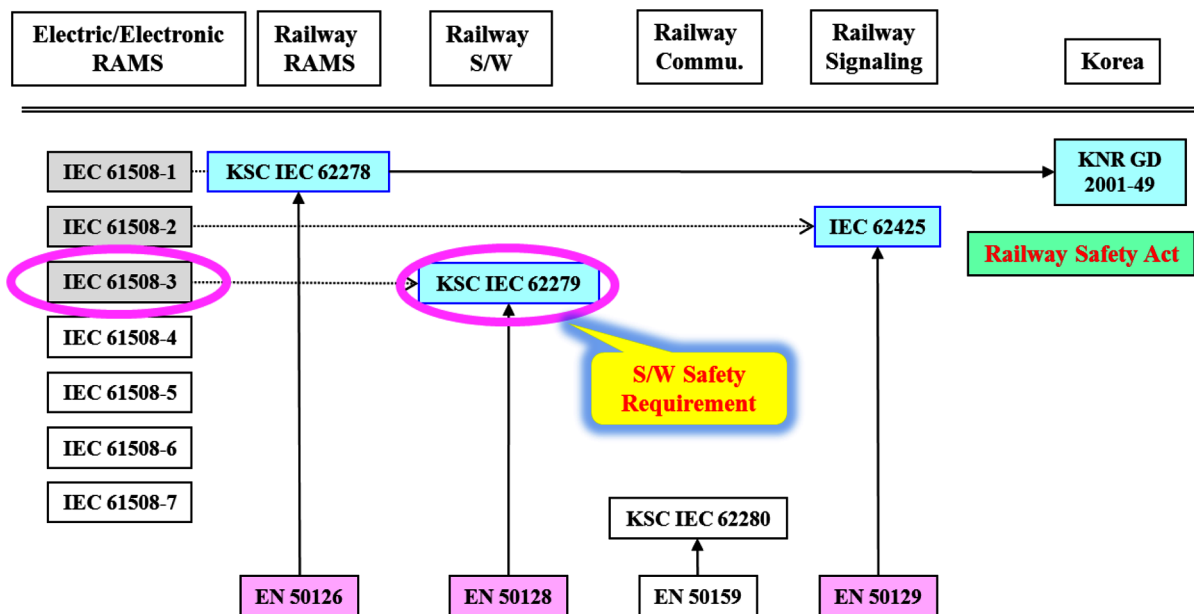
The railway signaling system, which is in charge of the most core function in a railway system, is changing from the existing electrical device to a computer-based control system in accordance with the development of the recent computer technology. Accordingly, the software operates many parts of the main functions

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of the signaling system, and the dependence on software has been continuously increasing. Especially, there are many major signaling functions has been operated by software, such as the distance control function between two running trains, safety route control function in trackside, signaling aspects control, etc. As the railway signaling system software becomes more complex, the importance of the software being utilized more within the railway signaling system is increasing (Signor et al., 2014), (Zhu et al., 2014), (Rao et al., 2010), (Lawrence, 2000), and (Fewstar & Gramham, 1999)

Safety requirements for railway signaling system software was recently internationally standardized by IEC 61508, IEC 62279 and IEC 62425 like Figure 1. Due to the enactment of the Korean Railway Safety Act, the rules regarding safety standards of railway facilities, etc., various software testing and validation activities required by international standards, in relation to the railway signaling system, are also beginning to be required in Korea. There are several efforts to learn more information about software testing tools, but there are not suitable for the railway signaling system software on vital one required high level safety like Robyn et al. (1999), Fewstar and Graham (1999), Yeom et al. (2009), and Kadry (2011). The software verification is become main issues in safety assessment of railway signaling system based on related international standards. So the software testing and verification very important. In addition in Korea, the validation on software is mainly dependent on documents needed for the development process, and the quantitative analysis tests are completed for only for a fraction of it. Accordingly, the study for testing and validation of railway signaling system software according to the related international standards has progressed from several years ago like Hwang et al. (2008, 2009, 2010, 2013) in Korea (Figure 1).

Figure 1. Railway RAMS related international standards



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