

Original article

# A component-based topology model for railway interlocking systems

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## Abstract

Writing interlocking logic is an important part of designing a railway interlocking system. In this paper a new method which increases the efficiency of writing interlocking logic is introduced. That is describing interlocking rules and station topology separately, and producing interlocking logic automatically by associating topology data with interlocking rules using software tools. As interlocking rules remain the same, the work for a new station is to specify the topology data only and the new interlocking logic can be generated automatically. This paper emphasizes on a component-based model used to describe the topology of the station. In this model, a railway station is abstracted as a set of connected components, and route information can be deduced from the topology data. The model of station topology makes the idea of producing interlocking logic automatically possible.

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Interlocking system; Signaling system; Station topology; Component-based model

## 1. Introduction

A railway interlocking system is a kind of railway monitor and control system used in railway stations to control traffic safety, for example, to prevent trains from colliding. A typical railway definition of interlocking is “an arrangement of signals and signal appliances so interconnected that their movements must succeed each other in proper sequence” [9]. To understand railway interlocking better, several basic notions are explained first:

- (1) Tracks are divided into sections, and each section is associated with a unique track circuit which can detect if a train is occupying this section.
- (2) A point is a special type of section which merges two lines into one.
- (3) A switch is the mobile part of a point. Each switch has two possible positions called normal and reverse. The normal position is when the switch allows train to travel straight over the point and the reverse position is when the switch allows train to branch off from or onto a line [11]. The positions of switches control the connectivity between sections.
- (4) A semaphore is placed between two sections and only visible from one direction [7]. It is used to control the permission of train moving from one section to its adjacent section. When it shows red aspect, movement is forbidden; when it shows green or yellow aspect, movement is allowed.

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