

Parallel and Real-Time Programming

Exercise 3

Simple Simulation of a Railway System

A simple railway system is depicted in Figure 1. Its track topology consists of five track sections 1, ..., 5. In addition, there are three trains L1, L2, and L3. Each track section can be occupied by at most one train at the same time. You may assume that the length of the trains L1, L2, and L3 is smaller than the length of the track sections. Switches are part of track section 3. All trains can only run in forward direction.

Write an Ada program simulating this railway system. Trains shall be implemented by tasks, track sections by protected objects. Trains are supposed to drive according to the paths given in Figure 1. For example, at the beginning train L1 occupies train section 1. Then it runs to train section 3 and then to 4. At the beginning train sections 1, 2, and 5 are occupied, train sections 3 and 4 are free.

Please take into account that L1 enters train section 3 *before* it leaves train section 1. This is due to the fact that trains have a non-zero length. In addition, between entering and leaving a train section a certain amount of time passes. By choosing different values for these periods of time and for the other time periods (such as start time of trains, ...), different scenarios can be modeled.

Simulate **all** possible scenarios! Answer the following questions:

1. How many different scenarios exist?
2. Which scenarios lead to deadlock, which don't?

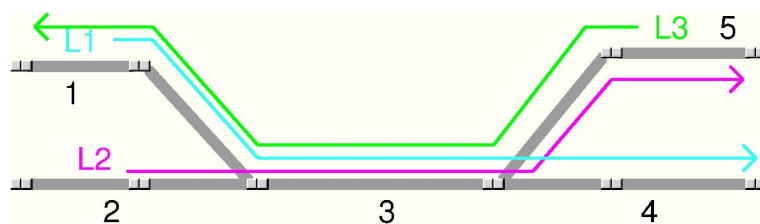


Figure 1: