Summary
The most important aspect of railway traffic management is the capacity to ensure safety. In pursuit of this goal, various railway traffic safety and control solutions have been developed and improved over the years. Starting from mechanical devices, to relays, to state-of-the-art computerised solutions, railway traffic control systems have always been supported by interlocking tables, the designing of which entails large responsibility on account of their high complexity. These tables represent the relationships between individual elements comprising a railway route, i.e. a single travel of a rail vehicle from the start signal to the end signal.
For the sake of improved universality of the process in which interlocking tables are created, the MGLTAB method has been devised for automated creation of interlocking tables for in-station railway traffic control systems. The method has been adapted to the needs arising from frequent track layout changes which, in turn, result from the very nature of the requirements and needs defined for the given station. Its main purpose is to automatically generate all railway and shunting routes at a railway signal box. The method proceeds in two stages: design and generation. The first one is intended to create a database of objects including their properties that are necessary to complete the second stage. The method is based on the assumption that a specific station's database is built using a directory of elements that are characteristic of a typical interlocking table. The second stage of the MGLTAB method commences by learning about all the required objects and their properties, and proceeds by generating the relevant routes and rail switches.
At individual stages, all crossings are defined using dedicated algorithms of the MGLTAB method. The input data preparation methodology is based on the assumption that certain properties of objects (including temporary naming, choice of object sub-types) are introduced automatically. The first stage comprises certain assumptions to which one must definitely adhere, such as the requirement of identical coordinate x being set for no more than one pair (switch/switch or switch/fictive switch). Despite the fact that the method proceeds in two stages, it can be divided into 4 basic processes. Each process comprises specific algorithms that are necessary for its successful completion.
In order to present the relationships between individual elements in a process of a single railway travel, an adequate formal description has been assumed as a part of the modelling process with the purpose of analysing whether the routes previously generated are correct. The model consist of such components as the formal description of objects as well as functions mapping their properties and types. The last step comprises a record of the relationships between objects.
Intended to automate the process in which interlocking tables are generated, the method addressed in the paper is implemented by adding new components to popular and commonly used software tools (AutoCad, Visual Studio), owing to which no additional costs related to purchasing dedicated software are generated by using the MGLTAB method. This solution is intended to simply the relevant requirements, including those pertaining to programming. In order to be able to use the AutoCAD software in the design stage, a new dedicated toolbar and a group of layers characterising specific object types needed to be created. In the second stage, it was necessary to develop a code in the C# language along with the object part in the Windows Forms environment, which was to ensure the convenience of use. The software developed in Visual Studio is also named MGLTAB. 5

This dissertation addresses studies intended to verify the correctness of the method's underlying assumptions and the method itself. The authors referred to both the interlocking tables already in use as well as those that had been approved for stations within railway lines being upgraded. Based on schematic plans, their simplified versions were designed, and then railway as well as shunting routes were generated using the Visual Studio software platform. For the sake of verification of the method, the number of routes in real interlocking tables and that of their rail switches were compared. Conformity tests have confirmed the legitimacy of application of the MGLTAB method as well as the superiority of automation over traditional methods employed when creating interlocking tables. Some new terminology was also introduced under the research to characterise certain processes or tools (e.g. MGLTAB, being the authors' original name for the interlocking table generation tool).

The MGLTAB method corresponds only to a part of the interlocking table design process. However, thanks to its modular structure, it can be expanded at each stage. For instance, one can update object types by adding new objects and layers. Also the generation part can be expanded, if only to add overlaps, level crossings etc. Further development of the tool based on the MGLTAB method may contribute to reaching the capacity to generate fully fledged interlocking tables compliant with all the requirements applicable to polish railways. On account of the similarities in railway traffic management and signalling, the MGLTAB method may well be successfully used to generate interlocking tables in other countries, e.g. in the Czech and Slovak railways.