Solving Dynamic Network Problems by MIP Techniques

B. Geißler[1], A. Martin[2], and A. Morsi[3]

Abstract: Dynamic network problems such as the optimal control of water or gas networks lead to difficult mathematical problems whose solution requires to incorporate techniques from various mathematical disciplines. Partial differential equations are typically used to mathematically describe the physical phenomena of such networks such as the flow of water or gas in pipelines. When combinatorial decisions in networks, such as where to open or close valves or pipes and which compressors or pumps to switch on or off, must be modeled mixed integer programming techniques are short-listed. Methods that incorporate both structures are hardly available. In this talk we want to exploit mixed integer programming techniques and investigate whether it is possible to approximate partial differential equations in an appropriate way in order to come up with the right combinatorial decisions. We will study two real-world examples of this kind, water and gas networks, and discuss pros and cons of this approach.

[1,2,3] Department of Mathematics, TU Darmstadt
Schlossgartenstr. 7, 64289 Darmstadt, Germany
martin@mathematik.tu-darmstadt.de