Decision-making methods for operational flood management

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Abstract

In 1995, because of danger of flooding, a massive evacuation in the province of Gelderland in the Netherlands took place. The process of the evacuation went well, however, a life-threatening flood did not occur. The decision was based on deterministic information, experience and expertise. A robust method, where uncertainties (e.g. in water level forecast) are explicitly incorporated, was not used. There are several methods in decision theory, which allow including uncertainty in decision-making in an explicit way. This paper gives a description of such methods in the context of operational flood management. We focus on decision trees, decision influence diagrams and Markov Decision Processes. In the context of operational flood management, the methods usually require specification of conditional flooding probability, i.e. a flooding probability given some (uncertain) information. We present the application of such methods to operational decisions like evacuation or activation of an emergency storage area. We compare the methods with respect to ease of understanding and we shortly discuss whether there is a chance to apply the methods to real-life problems.

Keywords: decision-making, decision trees, decision influence diagrams, Markov Decision Processes, uncertainty, conditional flooding probability.

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