



UvA-DARE (Digital Academic Repository)

Solving large structured Markov Decision Problems for perishable inventory management and traffic control

Haijema, R.

Publication date
2008

[Link to publication](#)

Citation for published version (APA):

Haijema, R. (2008). *Solving large structured Markov Decision Problems for perishable inventory management and traffic control*. Thela Thesis.

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

This thesis centers around two optimization problems that are of general interest: the inventory control of a typical perishable product (blood platelet pools) and the dynamic control of traffic lights. Both problems can be formulated as multi-dimensional Markov Decision Problems (MDPs), which appear to be too large to compute an optimal solution. Nevertheless, by exploiting the problem structure, approximate solutions can be obtained by Stochastic Dynamic Programming (SDP). Simulation plays a crucial role in obtaining and evaluating these approximate solutions.

In Part I an SDP-Simulation approach is developed that allows to reduce the fraction of blood platelet pools that outdate, from more than 15% in current practice to only 1% or even less. A user friendly version of the software that was developed during this PhD project currently runs at one of the Dutch blood banks.

In Part II the dynamic control of traffic lights is optimized, such that the average waiting time per car is minimal. New approximate solutions are developed that perform very well for signalized intersections in isolation as well as for networks of intersections.

This thesis is not only of interest for its applications but also for its insights in how to solve multi-dimensional MDPs.

René Haijema (1976) obtained a Master of Science in Operations Research, with distinction (cum laude), at the University of Amsterdam (UvA). During this study he worked on transportation planning problems for the Dutch Ministry of Justice and for the Dutch Railways (NS-reizigers). After a stay for one semester at the University of Otago (New Zealand), René worked on a PhD project at the UvA, which he combined with a part-time position as a teacher. Currently, he is assistant professor at Wageningen University and Research center (WUR). His general research interest is optimization within the fields of transportation and logistics.

