LNMB

Nederlands
Genootschap voor
Besliskunde

Netherlands Society for
Operations Research

Leiden, 17 november 2006

Betreft: NGB/LNMB Seminar Lunteren, 18 januari 2007

Bijgaand treft u de aankondiging en het aanmeldingsformulier aan voor het 9-de "Lunteren Seminar", georganiseerd door het Nederlands Genootschap Besliskunde (NGB) in samenwerking met het Landelijk Netwerk Mathematische Besliskunde (LNMB). Het thema is dit jaar:

"OPERATIONS RESEARCH AND PUBLIC TRANSPORTATION"

Een achttal deskundigen, met uiteenlopende specialiteiten, zal dit onderwerp nader toelichten. De bijeenkomst zal worden voorgezeten door **Alexander Rinnooy Kan** (SER) en **Goos Kant** (ORTEC/Universiteit van Tilburg).
Wij hopen en verwachten dat dit onderwerp en het aangeboden programma uw interesse hebben.

Tevens biedt deze bijeenkomst u de gelegenheid om contacten te leggen en te hernieuwen, niet alleen met de 'professionals', maar ook met personen uit de academische wereld.

Indien u aanwezig wilt zijn, dan ontvangen wij uw aanmeldingsformulier graag zo spoedig mogelijk; de inschrijving sluit op **8 januari 2007**.
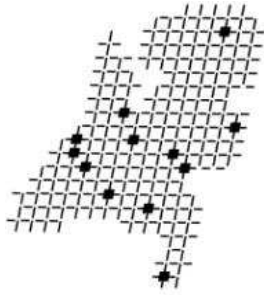
Met vriendelijke groet en in de hoop u in Lunteren te mogen verwelkomen,

Namens het NGB,   Namens het LNMB,

Joaquim Gromicho   Lodewijk Kallenberg
Harald Hoogstrate

LNMB

"OPERATIONS RESEARCH AND PUBLIC TRANSPORTATION"

Jointly organized by the Landelijk Netwerk Mathematische Besliskunde (LNMB) and the Nederlands Genootschap Besliskunde (NGB), Conference Center "De Werelt", Lunteren, January 18, 2007.

The Nederlands Genootschap voor Besliskunde (NGB) and the Landelijk Netwerk Mathematische Besliskunde (LNMB) jointly organize the one-day seminar "Operations Research and Public Transportation", in Conference Center 'De Werelt', Lunteren, on January 18, 2007.
The Seminar is chaired by **Alexander Rinnooy Kan** and **Goos Kant**

The seminar is the 9th in a series of annual seminars, following the previous successful seminars on *Operations Research & Enterprise Resource Planning* (1999), *Operations Research in Financial Management*(2000), *E-Commerce & Operations Research* (2001), *Capacity Management - How Operations Research models support decision makers* (2002), *New developments in Operations Research software* (2003), *On-line methods: Challenges for OR in a real-time world* (2004), *Mathematical Models for Financial Optimization* (2005) and *Operations Research and Health Care* (2006).

Mobility is essential to our hectic existence. Mass public transportation is of the utmost importance. The services offered by train, bus, tram, air or other passenger carriers should be reliable, fast, efficient, and competitively priced. It is therefore understandable that Operations Research cannot be missed. And this is the case in more than just the obvious activities.
The Dutch OR Society and the Dutch Network of Operations Research proudly present a collection of presentations which will take the audience through those complex planning activities that cannot be achieved without OR.
A dramatic example is clearly the time-table of the Dutch railways. The Dutch railways are extreme users of the railway infrastructure of The Netherlands, undoubtedly among the busiest in the world. 2007 will witness the emergence of a new time-table, which already raised much attention in the media. The attendants will appreciate the magnitude of such a planning achievement.
Public transporters search continuously for sources of revenue. Using the vehicles as an advertising medium is a way to generate revenues which can help the companies to improve their service level competitively. However, advertisers also plan and therefore matters become quite interesting when deciding how to rent a few square meters of vehicle surface to place advertisements.
Even the revenues generated by the primal activity of a carrier, passenger transportation, are subjected to complex management. The same seat may be - and in fact is - sold for different prices. This requires careful judgment: too cheap leads to loss of revenue, while too expensive to the loss of opportunity.
And what happens to all those resources when off-duty? They require cleaning and maintenance. And this requires careful planning which, despite not being perceived by the everyday passenger, is essential to ensure the safety and the comfort of the daily voyages.
 Of course those complex transportation terminals, such as airports, comprise many activities performed by different professionals. Planning each of them is already a challenge, but higher gains are possible when integrated planning is achieved.
And at the moment of execution, when the vehicles are competing with many other vehicles for mobility space, things deviate dramatically from the ideal path which is assumed at the planning table.

All these, and more, challenges are present throughout this day to show how this - often invisible but always powerful - science called Operations Research helps make things better for the daily commuters. Let us say, for us all!

SEMINAR PROGRAM:

09.30 – 10.15   Registration and Coffee
10.15 – 10.25   Welcome and introduction by the chairmen Alexander Rinnooy Kan and Goos Kant
10.30 – 11.10   Leo Kroon: *A survey of OR models and techniques for the planning of Public Transportation*
11.20 – 11.50   Marieke de Koning: *Making money out of public transportation: performance measurement of bus and tram advertising*
12.00 – 12.30   Gerard Kindervater: *Revenue Management in the Airline Passenger Industry*
12.30 – 13.50   Lunch
13.50 – 14.20   Dennis Huisman: *Timetable 2007: why and how?*
14.30 – 15.00   Guido Diepen: *Planning of busses and gates at Amsterdam Airport Schiphol*
15.10 – 15.40   Ramon Lentink: *Where do train units stay when they're off duty?*
15.50 – 16.20   Michiel Odijk: *Application of OR to settle a major HRM conflict at Dutch Railways*
16.30 – 17.00   Niels van Oort: *The moment of execution: real-life monitoring and control of public transport operations in major urban areas*
17.00 – 18.00   Drinks

The conference language is English. To participate at the seminar, please fill in the attached registration form and return it **before January 9, 2006**.
The conference fee is € 75 Euro for LNMB and NGB members, and € 125 for others. You will receive an invoice after your registration form has been received. The conference fee covers lunch, coffee, tea, and drinks.

This seminar is organized during the last day of a three days conference on Operations Research. The topics of first two days are more on theory and methods and are mathematically oriented. For information see also www.lnmb.nl/conferences/lunteren2006.

ADDRESS SEMINAR:
Conference Center `De Werelt'
Westhofflaan 2
Lunteren
The Netherlands
Tel: 0318 - 484641
For more information, e.g. 'how to reach' see: www.congrescentrum.com

SHORT BIO's

Leo Kroon (NS Reizigers, Utrecht; Erasmus University, Rotterdam)
Leo Kroon studied Mathematics at the Free University in Amsterdam. In 1990, he defended his Ph.D. thesis *Job Scheduling and Capacity Planning in Aircraft Maintenance* at Erasmus University Rotterdam. Since 1996, he has been a logistic consultant in the department of Logistics of NS Reizigers, the main operator of passenger trains in the Netherlands. Besides that, he is a part-time professor of Quantitative Logistics at the Rotterdam School of Management of Erasmus University Rotterdam. His main research interest is the development of decision support tools for planning and operations control of railway systems.

Marieke de Koning (Pointlogic, Rotterdam)
Marieke de Koning graduated in Econometrics in 2002, with a combined specialisation in Operations Research and Marketing. She has worked as an analytical consultant at Pointlogic since her graduation. Pointlogic is a consulting software company enabling smart decisions for its clients by delivering software based solutions. The company specializes in applying mathematical and econometric techniques in the areas of media, marketing, HRM, health care and security.

Gerard Kindervater (KLM Royal Dutch Airlines)
Gerard Kindervater has been a research assistant at CWI in Amsterdam in the 1980's. In 1988 he accepted a position as assistant professor at Erasmus University in the Department of Computer Science of the Economic Faculty. Since 1999 he works for KLM Royal Dutch Airlines in the Department of Pricing and Revenue

Management. Currently he is involved in the development of a joint revenue management system for Air France and KLM.

Dennis Huisman (Erasmus University Rotterdam; NS, the Netherlands Railways)

Dennis Huisman (1978) is a part-time Assistant Professor at the Econometric Institute of the Erasmus University Rotterdam. Moreover, he works part-time as logistic consultant at NS, the Netherlands Railways. He combines these two jobs since 2004 after obtaining his Ph.D. at the Erasmus University Rotterdam. In both jobs, Dennis does research on topics as vehicle scheduling, crew scheduling and crew rostering. He has published several articles in journals as Transportation Science, European Journal of Operational Research and Journal of Scheduling. Moreover, he is one of the founders and current director of the Erasmus Center for Optimization in Public Transport, where optimization problems in public transport are studied.

Guido Diepen (Utrecht University)

Guido Diepen conducted his master's research at the The National Aerospace Laboratory (NLR). He got his master's degree on 19 December 2003 and the topic of his master's thesis was *Solving the gate assignment problem using column generation.*
He started as a PhD student at the Algorithmic Systems groups in the Department of Information and Computing Sciences of the Utrecht University in April 2004. Current research topics deal with integrating sequential scheduling problems into one big problem. Furthermore, he is investigating the gate and bus planning problems at Amsterdam Airport Schiphol, as well as the integration of these problems.

Ramon Lentink (ORTEC, Gouda)

In 1995, Ramon Lentink started his study Econometrics at the Free University of Amsterdam. In 1999, he graduated with a Master's thesis on the subject of train crew scheduling. The thesis was written at ORTEC, one of the key providers of advanced planning and scheduling software, and the developed algorithms were applied to real-life problems provided by Netherlands Railways Passengers.
From September 1999, he has been working as a consultant at ORTEC. Here, he applies Operations Research models and algorithms to problems of clients in the field of logistics. From October 2000 until February 2006, he combined his work at ORTEC with a part-time Ph.D. study at the Rotterdam School of Management of the Erasmus University Rotterdam. The subject of his Ph.D. research was the development of mathematical models and algorithms for supporting railway shunt planners. The corresponding research was carried out in close cooperation with the logistics department of Netherlands Railways Passengers. The research resulted in the Ph.D. thesis "*Algorithmic Decision Support for Shunt Planning*", which was successfully defended in February 2006. Since January 2006, Ramon is full-time employed at the Algorithmics department of ORTEC, where his current focus is shortest path problems in huge networks and vehicle routing problems.

Michiel Odijk (ORTEC)

Michiel Odijk (1969) studied mathematics at Eindhoven Universtity of Technology (TUE) and received his PhD in 1998 from Delft University of Technology (TUD) based on his thesis Railway Timetables Generation. Part of the research was done at Railned (now ProRail) in Utrecht. At the same time he held a position as assistent professor at TUD.
In 1998 he started working for ORTEC, where he remained a strong professional interest in railways and develops business in this area. As a consultant he lead a team of Operations Research experts working on the alternative crew assignment model for Dutch Railways.

Niels van Oort (HTM Personenvervoer N.V., Den Haag; TU Delft)

Niels van Oort (28) finished his Master study Civil Engineering at the Delft University of Technology in 2003. His thesis dealt with the relation between network planning of public transport and reliability of operations. After his study, he started working at the public transport company of The Hague, HTM. He works as a consultant/researcher at the department of research and development. He is involved in the RandstadRail project, the new light rail connection between the cities of The Hague and Zoetermeer. In this project his main focus is on the new operation control system: a system which shows the driver his punctuality and the dispatchers can monitor the position as well as the punctuality of all the vehicles. This system helps to achieve high reliability of RandstadRail. Besides this project Niels participates in different infrastructure projects and rider ship studies of HTM. At the beginning of 2006, Niels started a PhD study at the Delft University of Technology, section Transport and Planning.
Niels is a member of the board of "Jonge Veranderaars", an organization of young rail professionals and he is a board member of "KIVI NIRIA, verkeerskunde en vervoerstechniek", The Dutch Engineers Association, department of transport and traffic.

ABSTRACTS

Leo Kroon (NS Reizigers, Utrecht; Erasmus University, Rotterdam)

A survey of OR models and techniques for the planning of Public Transportation
In this presentation, an overview will be given of quantitative models for public transport systems. Relevant elements to be taken into account are the passengers, the infrastructure, the line system and the timetable, the vehicles and the crew. Traditionally, quantitative models for public transport focused mainly on supporting operational planning processes such as timetabling, rolling stock circulation and crew scheduling and rostering. However, currently also strategic planning and real-time operations control are recognized as fruitful areas for the application of quantitative models. Especially disruption management is an important topic within real-time operations control.

Marieke de Koning (Pointlogic, Rotterdam)

Making money out of public transportation: performance measurement of bus and tram advertising
This presentation will focus on a very different application of OR in public transportation, namely on the performance measurement of public transportation ads. Performance of media channels is measured in two different measures: contacts and reach. How many people see an advertisement, and even more important: how many different people see an advertisement? Both measures combined describe indirectly the value of a product. That is why these measures are so important for media owners and media buyers to know.
Out of home media are extremely difficult to research. Unlike television, radio, press, etc. there is no editorial environment to provide a context. For these media a questioned individual might remember what they read, seen or listened to. Very few, if any, will have sufficient perception of the outdoor medium to give meaningful responses to question about posters on buses. So, the big question is: how can reach be measured for out of home media and more specifically: public transportation advertising?
To answer this question we will briefly explain how reach can be measured for non-moving items like billboards. For this we combine a displacement research with a route choice model and the actual positions of billboards. Then we focus on the aspects for moving billboards on public transport: timing and schedules become an issue, as well as the direction of the respondent compared to the bus or tram. The final result is a database which is integrated in media planning software that can be used to measure the performance of public transportation advertising campaigns.

Gerard Kindervater (KLM Royal Dutch Airlines)

Revenue Management in the Airline Passenger Industry
In the airline passenger industry, carriers try to maximize the seat revenue through the overbooking of lights by anticipating on forthcoming cancellations and no-shows, and through the offering of different fares for the same journey thereby limiting the number of seats available to the lower yielding fares.
For optimization roughly two models exist: (1) consider all flights independently of each other and treat connecting passengers as local passengers on each flight of their journey, and (2) build a network of connecting flights and evaluate passengers with respect to their complete journey from origin to destination. Whereas the flight based approach was used by all airlines in the past, nowadays it has been replaced by an origin-destination approach by all major network carriers.
In this presentation we will present both models and show their pros and cons. We will also discuss the issue of buy-down, which is a major drawback for successfully using present revenue management systems over a longer period, and show a possible way to overcome its negative effect.

Dennis Huisman (Erasmus University Rotterdam; NS, the Netherlands Railways)

Timetable 2007: why and how?
The timetable of 2007 (starting at December 10, 2006) is by far the most significant timetable change since 1970. In the first part of the presentation, we will discuss the main reasons why NS developed a completely, new timetable from scratch. One of the reasons to change the timetable is to improve the robustness of the railway system, which is mostly measured by its punctuality, i.e. the percentage of trains driving on time. Therefore, in the second part of the presentation, we will look at the relation between the timetable and the robustness of the system. Simulation can be used to determine this relation, and therefore, it was frequently used during the construction of the new timetable. Finally, we will discuss some recently developed Operations Research models that can improve the punctuality by slightly modifying the timetable. These models were not used in the timetable of 2007, but will probably be used in the near future.

Guido Diepen (Utrecht University)

Planning of busses and gates at Amsterdam Airport Schiphol
All aircraft visiting Amsterdam Airport Schiphol (AAS) need to be assigned to a gate. These gates can be divided into two categories, ordinary gates and remote stands. Aircraft assigned to remote stands must be served by one or more buses to transport the passengers.
When looking at the gate assignment problem, one of the stages is the one-day-ahead planning during which a schedule for the next day is generated.
The more robust this one-day-ahead schedule is, the less rescheduling will have to be done during the actual day when the real arrival and departure times deviate from the planned times.
The bus problem consists of planning for each bus which aircraft it must serve taking into account the legal constraints for the drivers. Here we again aim at finding a robust solution for the one-day-ahead problem to avoid replanning during the day due to deviations from the planned arrival and departure times.
For both of these problems, we present a solution approach based on column generation; for both problems we are able to find robust schedules in a matter of minutes.

Ramon Lentink (ORTEC, Gouda)

Where do train units stay when they're off duty?
Possibly, you never thought about this. However, off-duty train units pose an interesting planning problem for planners of railway operators. In general, the idle rolling stock is parked at a shunt yard, keeping the main railway infrastructure available for other train services. Shunt plans are created to coordinate the temporary parking of off-duty train units.
Shunt planning is one of the last elements of the planning process of a passenger railway operator. Therefore, every change in a previous step of the planning process is likely to require changes in the shunt plans at one or more stations, a total of 130 out of 380 planners at NSR are currently involved in shunt planning. Advanced planning support for shunt planners enables an increase of efficiency of the shunt planners. Moreover, it provides opportunities for reducing the throughput time of the overall planning process. In turn, a reduced throughput time enables a later start of the planning process, which results in more accurate input data for the planning process and therefore better plans.
In this presentation, we will introduce the most important processes that take place at a shunt yard during the night. Moreover, we will discuss the parking of train units at shunt yards in detail and describe a solution approach for this problem.
The solution approach is based on the well-known technique column generation, enabling the explicit generation of only a fraction of all possible columns, while guaranteeing the quality of the solution.
Computational tests on real-life data show that high-quality solutions are typically found within minutes of computation time. In addition, the developed algorithms are designed to interact with shunt planners. They provide a firm basis for an advanced planning system to support shunt planners in their everyday work.

Michiel Odijk (ORTEC, Gouda)

Application of OR to settle a major HRM conflict at Dutch Railways
In June 2001, Dutch Railways faced an internal conflict regarding a new crew assignment model. This led to a period of much turmoil, including nationwide strikes that lasted several days. The model assigned drivers and guards to train series that started or ended in their home base exclusively, yielding duties with little variation.
To address the conflict, the board of Dutch Railways and its Works Council agreed that the Council could develop an alternative crew assignment model. This agreement was spectacular in many ways, as rarely could the Works Council of a large company directly influence such a crucial part of the business process.
In October 2001, ORTEC and Basis & Beleid were asked to assist the Works Council with the development of an alternative crew assignment model.
The project started with a thorough survey of the planning process at Dutch Railways. Furthermore, the team investigated the crew assignment model challenges by visiting every crew base and discussing the situation with over 600 active personnel.
This process led to the development of five alternative crew assignment models by ORTEC / Basis & Beleid. In the two months thereafter, a team of six experts from ORTEC analysed these models in close cooperation with the Logistics department of Dutch Railways.
After five interactive sessions, each with over 70 personnel, the final alternative was selected by the personnel and then adopted by the Works Council. On May 22, 2002, the project reached a milestone with the presentation of the alternative model to the board of Dutch Railways.

The board accepted the alternative model on June 13 ending the period of turmoil.
The alternative model is called "Sharing Pleasures & Burdens" (Dutch: delen lusten & lasten). The philosophy behind the model is that all personnel should experience an equal amount of pleasure and an equal amount of burden in their work.
This innovative model sets boundaries on
* the amount of time a driver or guard works on fast trains and on trains that are labeled as socially unsafe,
* the number of different tracks and rolling stock types a certain crew base will be assigned, and
* the variation in the duties
In the presentation we will further set out this model, the road that lead to it, and the role Operations Research played in this process.

Niels van Oort (HTM Personenvervoer N.V., Den Haag; TU Delft)

The moment of execution: real-life monitoring and control of public transport operations in major urban areas
RandstadRail (RR) will be a new regional public transport system between The Hague, Zoetermeer and Rotterdam. RR will be a high level public transport system: short travel times and high frequencies. During peak hours the intensity on some trajectories will be about 24 vehicles an hour. RR will share some tracks with other tramlines as well. Dealing with this high frequencies and deviations, a system for controlling operations is necessary: because of offering travellers a high quality product, according to waiting times and chance of getting a seat, as well as making optimal use of the restricted capacity. To prevent congestion the operation of RR should be as much as possible according to the timetable.
To reach a high level of reliability, HTM designed a controlling philosophy. This exists of three steps. The most important aspect is distribution in deviation of the timetable. First step is preventing this deviation to occur: the infrastructure will be as much as possible exclusive right of way and at intersections RR will get priority over the other traffic. RR will stop at every stop and will never leave before schedule time. Second step in the philosophy is dealing with the deviation by planning extra time in the schedule at stops, trajectories and terminals. Small deviations can get solved in this way. Final step to get vehicles back on schedule will be done by the traffic control: they have a total overview of all vehicles and their deviations. They can take measures like slowing down vehicles nearby a delayed vehicle to optimize headways. In case of big disturbances derouting and shortening of lines are possible.

REGISTRATION FORM

I hereby register for the LNBM/NGB seminar "**Operations Research and Public Transportation**", which will be held in Conference Center "De Werelt", Lunteren, January 18, 2007.

Family name:

……………………………………………………………………………

First name:

……………………………………………………………………………

Title:

………………………………………………………………….…….

Company/Institute: ………………………………………………………………….

Address: ………………………………………………………………………….

Postal Code: …………………….   City:

………………………………………

Telephone number: ………………..   E-mail: …………………………………

Date: ………………………….   Signature:

………………………………

Below, please tick the appropriate box:

I am:

LNMB/NGB member (Registration fee € 75):   ☐

Other (Registration fee € 125):   ☐

FEE PAYMENT INSTRUCTIONS WILL BE SENT TO YOU AFTER REGISTRATION

Send the registration form before January 8, 2007 by regular mail or e-mail or by fax to

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