2 - Optimal experimental design for a pure birth process with incomplete information
Ali Eshragh Jahromi, School of Mathematical Sciences, The University of Adelaide, North Terrace Campus, 5005, Adelaide, South Australia, Australia, ali.eshraghjahromi@adelaide.edu.au

Our goal is to estimate the rate of growth of a population governed by a stochastic model. We may choose n time points at which to count the number of individuals present, but due to detection difficulties, or constraints on resources, we are able only to observe each individual with fixed probability p. We discuss the optimal times at which to make our n observations in order to maximize Fisher Information. For computational and analytical reasons which will be discussed, we specifically focus on the cases n=1 and n=2, presenting both theoretical and numerical findings.

3 - Implementation of an OR model for the comparison of higher technological education specialties
Vassilis Kostoglou, Department of Informatics, Alexander TEI of Thessaloniki, P.O. Box 141, 57400, Thessaloniki, Greece, vkostogl@it.teithe.gr, *Michael Vassilakopoulos*, *Christos Koilias*

This work focuses on the comparison of the specialties provided by the higher technological education regarding graduates' employment status and vocational prospects. A survey OR model is introduced consisting of original data collection from 5,183 Greek graduates corresponding to 45 specialties through a structure questionnaire and telephonic interviews. Bivariate, multivariate, and cluster analysis identified the statistically significant differences, leading to findings and providing guidelines for the selection of a field of studies that leads to a more promising professional career.

■ WB-38

Wednesday, 10:30-12h00
HH-Colombus

Multiobjective Optimization and Transportation

Stream: Multiobjective Optimization
Invited session

Chair: *Anatoly Levchenkov*, Riga Technical University, 1658, Riga, Latvia, anatolijs.levcenkovs@rtu.lv
Chair: *Mikhail Gorobetz*, Institute of Industrial Electronics and Electrical Engineering, Riga Technical University, 1 Kalku Street, Riga, Latvia, mihails.gorobecs@rtu.lv

1 - Multi-Objective Road Pricing: A Game Theoretic and Multi-Level Optimization Approach
Anthony Ohazulike, Applied Mathematics, University of Twente, Drienerlolaan 5, 7522 NB, Enschede, Netherlands, a.e.ohazulike@utwente.nl, *Georg Still*, *Walter Kern*, *Eric van Berkum*

Using a game theoretical approach, we develop a pricing scheme that internalizes multiple traffic externalities. Further, we extend the single authority road pricing scheme to a scheme with multiple actors/stakeholders or regions. Road users' interests are represented in the upper and the same level as the decision makers, thus, making them active players in the toll setting game. Having shown that pure Nash equilibrium (NE) toll may not exist among the stakeholders (with likely opposing objectives), we design a mechanism that induces NE which coincides with system optimum.

2 - Multi-objective optimization with an immune algorithm for a railway safety control system
Andrew Mor-Yaroslavtsev, Riga Technical University, Kronvalda bulv.1, LV-1010, Riga, Latvia, andrejs@rtu.lv, *Anatoly Levchenkov*

This paper describes an immune clonal selection algorithm used together with a negative selection algorithm for use in an intelligent railway electric vehicle safety system. Embedded devices collect data about the rolling stock location and status, communicate it to the server and other devices, and use it to avoid dangerous situations. The authors examine the means of communication between the embedded devices and their effectiveness. The authors review data analysis methods used to detect, predict and control undesirable rolling stock travel conditions.

3 - A Multi-Objective Minimum Cost Flow Problem to Design Safe Walking-Routes for School Children
Ken-ichi Tanaka, The University of Electro-Communications, 1-5-1, Chofugaoka, Chofu, Tokyo, Japan, 182-8585, Tokyo, Japan, ken1tnk@se.uec.ac.jp, *Ryuhei Miyashiro*, *Yuichiro Miyamoto*

For school children to walk safely to and from school, it is important to walk in groups, not alone. However, walking together may force children to walk longer distances than those of their shortest paths. A multi-objective minimum cost flow problem is presented in which both the total walking distance and the total distance walked alone for children are minimized. Pareto optimal solutions show that the total distance walked alone can be greatly reduced by making children slightly deviate from their shortest paths. Heuristically obtained solutions for a real road network are also analyzed.

4 - Use of Adaptive Control Systems in Multi-Criteria Tasks in Electric Transport Control
Andrejs Potapovs, Faculty of Power and Electrical Engineering, Riga Technical university, Riga Kalku 1, LV1658, Riga, Riga, Latvia, Andrejs.Potapovs@rtu.lv

Nowadays, there are very topical issues, which are connected with the security of rail transport routing and it is caused by the fact that train intensity and the speeds, which raise the requirements for an observation of a train movement timetable and for the safety level of all train movement, are constantly increasing. The following assumption is proposed: a programmable logic controller (PLC) with a control program on the basis of the adaptive control algorithms, smooth and precise braking of a train in multi-criteria motion conditions in a single train anti-collision system.

■ WB-39

Wednesday, 10:30-12h00
HH-Cousteau

Dynamic Programming 2

Stream: Dynamic Programming
Invited session

Chair: *Martina Hesse*, Chair of Production and Lgistics, Georg-August-Universität Göttingen, Platz der Göttinger Sieben 3, 37073, Göttingen, Germany, Martina.Hesse@wiwi.uni-goettingen.de

1 - A Dynamic Classification and Prediction Model for Road Departure Warning Systems
Andre Possani Espinosa, Department of Digital Systems, Instituto Tecnológico Autónomo de México, Rio Hondo No.1, 01080, Mexico City, D.F., Mexico, andre.possani@itam.mx, *Marta Cabo Nodar*, *Edgar Possani*

One of the main tasks identified in the SAFESPOT IP Project, cofunded by the European Union, was the development of a Road Departure Prevention Application. This application relies on the identification and prediction of vehicle trajectories in order to provide in-advance warnings to drivers and therefore prevent deadly road accidents. Continuing with this work, we will present an application of a dynamic adaptive model evaluated with real and simulated data. Results obtained are compared with previously implemented techniques.

2 - Some applications of Optimal Control in Sustainable Fishing in the Baltic Sea
Dmitriy Stukalin, Universität Greifswald, Greifswald University, Rathenau-Str., 47, 17489, Greifswald, Germany, dimidron85@rambler.ru