

# Alex A. Kurzhanskiy

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## EXPERTISE:

### Author of:

- Ellipsoidal Toolbox (<http://code.google.com/p/ellipsoids>)
- Aurora Road Network Modeler (<http://code.google.com/p/aurorarm>)

Research: Dynamical systems: reachability, control, estimation, identification;  
Network flow control; Distributed parameter systems;  
Convex optimization; Game theory; Data visualization;  
Partial Differential Equations: numerical methods, inverse problems;  
Transportation systems: macroscopic models, estimation, control.

Software development: Unix/Linux, pSOS, VxWorks;  
IPC, RPC, RDBMS, WWW;  
Control System Modeling & Simulation;  
GIS, Google Maps API;  
Network Management Systems.

### Programming:

C, C++, Java, Python, SQL, shell;  
LabVIEW, MATLAB;  
XML, HTML, JavaScript;

### Cloud Computing:

MapReduce (Hadoop);

### Networking:

IP, TCP, UDP, BGP, OSPF, MPLS, SNMP, TL1;

### Revision Control:

ClearCase, CVS, Subversion, VSS, RCS, PRCS.

## EDUCATION:

2007 PhD in Electrical Engineering & Computer Science  
from University of California, Berkeley.

1998 MA in Applied Mathematics and Computer Science  
from Lomonosov Moscow State University (Russia).

## RESEARCH EXPERIENCE:

### January 2008 – Current

EECS Department in University of California, Berkeley:  
Postdoctoral Researcher.

Tools for Operational Planning (TOPL) Project:

<http://path.berkeley.edu/topl>.

- Leading the development of the **Aurora RNM** © system:

<http://code.google.com/p/aurorarm>.

Aurora Road Network Modeler is a set of tools for operational planning and management of travel corridors (road networks comprised of freeways and surrounding urban arterials) and analysis of their performance. It is based on the Aurora object-oriented framework for simulation and analysis of flow networks, and is implemented in Java. California Department of Transportation (Caltrans) is currently evaluating Aurora RNM for using in operations planning. Berkeley Transportation Systems (<http://www.bt-systems.com>) is using Aurora RNM for dynamic traffic prediction and scenario evaluation.

### August 2003 – December 2007

EECS Department in University of California, Berkeley:  
PhD Student. Advisor: professor [Pravin Varaiya](#).

Member of the TOPL Project.

- Initiator and author of **Aurora object-oriented framework** © for simulation and analysis of flow networks, such as road networks, oil/gas pipelines and irrigation canals: <http://www.eecs.berkeley.edu/Pubs/TechRpts/2007/EECS-2007-148.html>.
- Author of **CTMSIM** © – interactive freeway traffic macro-simulator for MATLAB: <http://path.berkeley.edu/topl/software.html>.  
CTMSIM has proved to be a handy tool for transportation researchers who can use it for evaluating ramp metering algorithms and for estimating the impact of different response times in the incident management.

Member of CHESS: <http://chess.eecs.berkeley.edu>.

- Initiator and author of the **Ellipsoidal Toolbox**© (ET) for MATLAB – implementation of Ellipsoidal Calculus and reach set computation for piecewise linear continuous- and discrete-time systems with disturbances: <http://code.google.com/p/ellipsoids>. This toolbox is used by control and estimation research community throughout the world including UC Berkeley, Stanford University, MIT, CMU, Moscow University (Russia), ETHZ (Switzerland), VERIMAG (France), Lund University (Sweden), NASA Ames. ET is also distributed as part of the **Multi-Parametric Toolbox (MPT)**: <http://control.ee.ethz.ch/~mpt>.

## **INDUSTRY EXPERIENCE:**

### December 2000 – July 2003

Ditech Communications (Nasdaq: DITC), Mountain View, CA:

Network Engineer (Echo Cancellation Products)

- Developed the Element Management Systems for various families of Echo Cancellation products (Netconsul™)  
<http://www.ditechnetworks.com/platforms/management.html>
- Worked on the Voice Quality Monitoring (VQM) in TDM networks until leaving the company.  
Customers of Ditech Echo Cancellation Products include Qwest, AT&T, Nextel, Verizon as well as various telecommunications companies in Brazil, India and China.

### July 1998 – December 2000

Ditech Communications, Mountain View, CA:

Software Engineer (Optical Products)

- Responsible for the software portion of the Optical Telemetry System (OTS): software support for EDFAs, optical transmitters, receivers, transponders; TL1 interface; configuration management.  
Major customers for the OTS included Lucent, Nortel and Cisco.
- Developed test automation suite for EDFAs and transponders that was used by Manufacturing and Optical Engineering Departments.  
Customers of Ditech Optical Products include Ericsson and Lucent.  
In 2001 Optical Products became Altamar Networks, wholly owned subsidiary of Ditech, that was sold to JDS Uniphase (Nasdaq: JDSU) in 2003.

## **Work as independent contractor:**

2009 Berkeley Transportation Systems Inc., Berkeley, CA: Integration of Aurora RNM simulator into the traffic prediction subsystem of PeMS (<http://pems.eecs.berkeley.edu>).

2009 Celeridyn Inc., Roseville, CA: Set of efficient algorithms for conversion of large scale GIS data into directed graphs. Supporting software functionality description and design.

2002 – 2006 LASMED LLC, Mountain View, CA: LabVIEW interface for Diode Laser Neuro-Stimulator used for functional MRI.

2001 (July – October) Calmar Optcom, Sunnyvale, CA: LabVIEW suite of simulation and data acquisition tools for laser testing.

2001 (May – June) Sparkolor, Santa Clara, CA: LabVIEW Laser test automation application.

## PUBLICATIONS:

- ***Using Aurora Road Network Modeler for Active Traffic Management***  
A. A. Kurzhanskiy and P. Varaiya.  
Invited paper. American Control Conference 2010.
- ***Active Traffic Management on Road Networks: A Macroscopic Approach***  
A. A. Kurzhanskiy and P. Varaiya.  
Submitted to transactions of Royal Society in March 2010.  
Online: [http://lihodeev.com/pubs/2010\\_ATM\\_OnRoadNetworksMacroscopic.pdf](http://lihodeev.com/pubs/2010_ATM_OnRoadNetworksMacroscopic.pdf)
- ***Reach Set Computation and Control Synthesis for Discrete-Time Dynamical Systems with Disturbances***  
A. A. Kurzhanskiy and P. Varaiya. Submitted to Automatica in February 2010.  
Online: [http://lihodeev.com/pubs/2010\\_ReachSetControlSynthesisForDTDS.pdf](http://lihodeev.com/pubs/2010_ReachSetControlSynthesisForDTDS.pdf)
- ***Aurora RNM – A Macroscopic Simulation Tool for Arterial Traffic Modeling and Control***  
A. H. F. Chow, G. Gomes, A. A. Kurzhanskiy, P. Varaiya.  
89<sup>th</sup> Annual TRB Meeting, 2010.
- ***Macroscopic Modeling of Multiple Vehicle Types and Freeways with HOV Lanes***  
A. A. Kurzhanskiy and A. Muralidharan.  
Working paper. July 2009. Online: [http://lihodeev.com/pubs/2009\\_ModelingHOV.pdf](http://lihodeev.com/pubs/2009_ModelingHOV.pdf)
- ***Set-Valued Estimation of Freeway Traffic Density***  
A. A. Kurzhanskiy.  
12<sup>th</sup> IFAC Symposium on Control in Transportation Systems, 2009.
- ***Aurora Arterial Modeler – A Macroscopic Tool for Urban Traffic Signal Control***  
A. H. F. Chow, G. Gomes, A. A. Kurzhanskiy, P. Varaiya.  
12<sup>th</sup> IFAC Symposium on Control in Transportation Systems, 2009
- ***Aurora Road Network Modeler***  
A. A. Kurzhanskiy, J. Kwon, P. Varaiya.  
12<sup>th</sup> IFAC Symposium on Control in Transportation Systems, 2009.
- ***Aurora – Object-Oriented Framework for Simulation and Analysis of Flow Networks***  
A. A. Kurzhanskiy, J. Kwon, P. Varaiya. 2008.  
Online: [http://lihodeev.com/pubs/2008\\_AuroraRNM\\_Fundamental.pdf](http://lihodeev.com/pubs/2008_AuroraRNM_Fundamental.pdf)
- ***Computation of Reach Sets for Dynamical Systems***  
A. A. Kurzhanskiy and P. Varaiya.  
Chapter for Control Handbook, 2<sup>nd</sup> Edition, 2008.
- ***CTMSIM – An Interactive Macroscopic Traffic Simulator for MATLAB***  
A. A. Kurzhanskiy and P. Varaiya. October 2008.  
Online: [http://lihodeev.com/pubs/2008TRC\\_CTMSIM.pdf](http://lihodeev.com/pubs/2008TRC_CTMSIM.pdf)
- ***Modeling and Software Tools for Freeway Operational Planning***  
A. A. Kurzhanskiy.  
Technical Report 2007-148 (PhD Thesis), EECS, UC Berkeley, 2007.
- ***Behavior of the Cell Transmission Model and Effectiveness of Ramp Metering***  
G. Gomes, R. Horowitz, A. A. Kurzhanskiy, P. Varaiya, and J. Kwon.  
In Transportation Research C, 16(4), 485-513, 2008.
- ***Congestion in the ACTM Model***  
G. Gomes, R. Horowitz, A. A. Kurzhanskiy, P. Varaiya, and J. Kwon.  
European Control Conference 2007.

- ***Ellipsoidal Techniques for Reachability Analysis of Discrete-Time Linear Systems***  
A. A. Kurzhanskiy, P. Varaiya.  
In IEEE Transactions on Automatic Control, 52(1), 26-38, 2007.
- ***Ellipsoidal Toolbox (ET)***  
A. A. Kurzhanskiy, P. Varaiya.  
45<sup>th</sup> IEEE Conference on Decision and Control 2006.
- ***Ellipsoidal Toolbox***  
A. A. Kurzhanskiy, P. Varaiya.  
Technical Report 2006-46, EECS, UC Berkeley, 2006.

#### **MISCELLANEOUS:**

- US Citizen.