informs
USF STUDENT CHAPTER

THE OR TIMES

USF UNIVERSITY OF SOUTH FLORIDA

News Feature

OR vs Polar Bears: The Ensuing Controversy

A few weeks ago after John McCain announced Sarah Palin as his running mate I read the following headline: Sarah Palin vs Polar Bears. The headline referred to an op-ed piece Mrs. Palin (the governor of Alaska) wrote for the New York Times this past January in which she expressed her opposition to add polar bears under the Endangered Species Act. Some environmental groups had claimed that global warming and the reduction of polar ice severely threaten the bears' habitat and their existence. Mrs. Palin countered that the current population of polar bears is higher than it was 40 years ago.

Why am I bringing this up? I decided to do some research about the topic and this is what I found out. In 2007 the U.S. Geological Survey (USGS) was asked to come up with studies projecting polar bear population in the future and possible impacts of sea ice projections in their habitat. The USGS team included scientists from within the USGS, polar bear scientists from Canada and other scientists from academia and the private sector. The overall conclusion issued in September 2007 was that "projected changes in future ice conditions, if realized, will result in loss of approximately 2/3 of the world's polar bear population by the mid 21st century". They also added that this estimate was conservative.

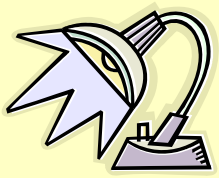
In May of this year the polar bears were effectively listed under the Endangered Species Act. However, there is another chapter to this story. In May 2008 a group of researchers; J. S. Armstrong (UPenn), K. C. Green (Monash University, New Zealand), and W. Soon (Harvard) published a paper in *Interfaces* (an INFORMS Journal) taking issue with the methodology used by the earlier studies commissioned by USGS. Armstrong et al. claimed that none of the studies employed scientific forecasting methodology and that all of them were products of complex sets of assumptions. Furthermore, they found out that none of the studies included references to scientific works on forecasting methods. (The USGS studies are not peer- reviewed by the way). Armstrong et al. also pointed out that the recommendations made by the USGS studies (listing polar bears as endangered species) do not follow from their research unless they would have assumed that global warming will occur and will reduce the extent of summer sea ice, which is something Armstrong, Green, and Soon basically do not agree with. In fact, after "googling" the authors' names I learnt that one of them, Willie Soon, is one of the most prominent scientists against the thesis that global warming is man-made.

This story reveals pretty interesting facts about the use of data driven models to set public policy, some of which are: 1) It seems a bit weird to me that reports intended to set public policy are not peer-reviewed, 2) It is hard for researchers to avoid infusing their beliefs with respect to a subject matter when setting assumptions to build models for which the consideration of that particular subject is crucial. Ideally, people who are neutral about the subject should work on such models, but this is an oxymoron. A researcher can hardly be neutral about a topic he/she has knowledge of (and he/she needs to be an expert on the topic to build the model). 3) It is fine to be in favor or against Sara Palin's column. (After all, Armstrong et al. just criticized the USGS models, without proposing a suitable model of their own). However, I do not think she had some sort of study in her hands when she wrote the piece, 4) I bet polar bears do not really care about all this scientific-ideological debate and are happy to be listed as Endangered Species.

By Patricio Rocha
PhD. Student, Industrial Engineering

Successful Dissertation Defense:

Athanasios Tsalatsanis (Sakis)



Successful Proposal Defense:

Vishnu Nanduri

Completed Candidacy:

Athina Brintaki

Wilkistar Otieno

Volume 2, Issue 3
Fall 2008

Inside this issue:

Systems of Students

We know that understanding how systems work is a vital part of system modeling. Systems are everywhere, and most of them are enormously complex. For us engineers, it can sometimes be harder to model systems that don't lend themselves to a mathematical model. 'Real-world' systems, especially those outside of manufacturing, can be much vaguer and thus more difficult to model. What an interesting lesson to learn when starting an Equestrian Club!

I've never thought of a student club as a system. It is certainly an organization with a clear managerial hierarchy, financial basis, set of users, etc. The interactions that this organization has with its supplier (in this case, Student Government [SG]) can be extraordinarily complex and multi-faceted. As I've learned, finding the right information, paper work, and other 'data' is extremely difficult in a real-life situation. In addition, the organization's complexity is further manifested by the changes within the SG departments and personnel, as seniors graduate and others are employed/elected/nominated to fill in the vacant positions. Talk about system dynamics!

For me, this has been an extremely practical example in modeling and optimizing a dynamic, relatively complex system. Understanding the most successful structure of the system, maximizing system resources' utilization (my utilization is currently about 115%), defining relationships within the system, and controlling system interactions are all heavily present. More business-oriented aspects are also present, including extensive human relations, delegation of tasks, and always a little PR-damage control when mistakes are made. It just goes on to show that systems are everywhere and that understanding and beneficially manipulating the structure of systems make vast advancements. Who knew, this even applies in the horse world, as far away from statistical analysis as you can get!

Meredith Bounds

Senior, Industrial Engineering

What's all the Ruckus About Cap-and-Trade?

A topic that is being seriously discussed nowadays is the issue of limiting greenhouse gases (GHGs) (*its about time isn't it?*). A phrase you might have heard thrown around in the ongoing presidential campaigns as a tool to limit emissions is "cap-and-trade." What does it mean and how does it work?

Cap-and-trade (C&T) mechanisms have been used in the past to control and gradually reduce the SO_2 and NO_x emissions as part of the Acid Rain Program of the Environmental Protection Agency. This, along with the successful operation of a C&T market in the European Union, have motivated 10 of the northeastern states to launch an ambitious C&T market known as the Regional Greenhouse Gas Initiative (RGGI-pronounced Reggie). The ambitious goal of RGGI is to reduce the CO_2 emissions by 10% by the year 2018. The mechanism is actually quite simple. A cap is set for the total amount of greenhouse gases that can be emitted into the atmosphere by electric power generators. The cap is set in thousands of tons of CO_2 that can be emitted. Then, allowances are given to power generators based on their historical emissions information (generators are required to report this to government). Each generating company can pollute only as long as they have allowances. Severe penalties are assessed on those generators that exceed the number of allocated allowances. Each allowance is generally equal to a ton of pollution. For example, if a generator emits 10 tons of CO_2, then that generator surrenders 10 of its allowances. So that's the "cap" portion of the C&T mechanism.

If a generator does not use up all the allowances, it can "trade" them in an open market or "bank" them for future use. Generators who have used up all their allowances can buy them from the open market to avoid high penalties. So what's the incentive to reduce pollution? Here's the catch. The cap is reduced each year successively, making it difficult for polluting generators to continue their old ways. It forces generators to embrace cleaner, greener, and more efficient generating technologies, if they want to remain competitive. The cap is progressively reduced over a period of 5-10 years to "roll back" GHG emissions to old levels. Economists, policy analysts, and environmentalists strongly believe that a cap-and-trade mechanism has to be a fundamental component of any long term climate change policy.

Is it really that simple? Well…not really. There are several issues to be addressed. Who should be subjected to the cap-also known as the point of regulation? Upstream: where the fuel is actually produced; or Downstream: where the fuel is consumed? Should the allowances be distributed free of cost or auctioned?

If auctioned, which type of auction-uniform price or discriminatory auction?

Frequency of these allowance auctions? Monthly, quarterly, or yearly?

How to distribute these auction revenues?

Watch out for this space next time to get your dose of energy policy!!!

By Vishnu Nanduri

PhD. Candidate Industrial Engineering

Research corner

Enabling Biologically-Inspired Design and Nanoscale Engineering Through Computational Geometry

Bionanotechnology (BNT) is the new frontier in research and technology and is vital for the realization of biomedical and nanoscale products. Biologically-inspired design and nanoscale engineering are the means to achieve BNT and consists of manipulating biological molecules to create complex structures or devices with new molecular arrangements. By controlling, manipulating and assembling molecules we will be able to create lighter and stronger manufacturing materials, enhanced textiles and precise nanoscale devices with new capabilities for diagnosis and treatment of diseases. It is estimated that within the next 10 years, "at least half of the newly designed advanced materials and manufacturing processes will be build at the nanoscale" [NIH].

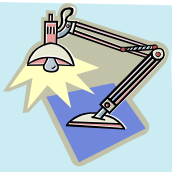
For the realization of BNT, it is crucial for researchers to be able to visualize the interactions between the various nanocomponents in real-time during the design stage, so that fully functional nanoscale products can be designed and evaluated prior to actual fabrication. A main key for enabling the visualization of the nanocomponents is the understanding, the effective modeling and the design of the behavior of biological molecules. To achieve a realistic molecular representation in real-time entails using rapid molecular tools that comprise molecules flexibility or, in other words, their ability to attain different shapes. A molecular conformation is a potential shape that a flexible molecule can adopt while searching for a stable molecular state. Molecules achieve stability by reaching a feasible (with no overlapping atoms) molecular conformation that contains the minimum possible internal energy value. The major challenge however, of modeling flexible molecules (or molecular conformations) lies on the exponential explosion in computational complexity as the molecular size increases and a large number of degrees of freedom (DOF) are considered to represent the flexibility of the molecules. Therefore, modeling in real-time the molecular behavior remains the main challenge in molecular design, making the modeling of molecular performance a highly intensive computational task with unlimited room of improvement.

In recent years, computational geometry has a resourceful role in molecular design since important constraints influencing molecular behavior can have geometrical interpretation. Incorporating within the molecular design the geometric information that lies within the inter-atomic interactions (intramolecular energy), allows to approximate molecules' performance rapidly and efficiently. Speeding the modeling and reducing the time associated with molecular design is a crucial step towards the enablement of molecules' manipulation in a virtual environment (real-time molecular design) and for the realization of BNT. Therefore, computational geometry is the center of attention in this research work.

From a geometric point of view, a molecule can be modeled as a highly articulated body with hundreds or even thousand DOF. Given that the number of possible molecular conformations grows in proportion to the power of the number of torsion bonds (DOF), identifying feasible molecular conformations remains the main difficulty in molecular design. To address this challenge, our research work presents an enhanced Biologically-Inspired Geometric Filter called *eBGF generic methodology*, which incorporates certain chemical-motivated assumptions regarding atoms' connectivity and molecules' flexibility for study chemical-feasible molecular conformations. The proposed work geometrically interprets the chemical information that lies within the intramolecular energy to force the geometric constraints under which a molecular conformation is considered feasible and is accepted as a candidate molecular state. Our proposed molecular modeling tool aims to analyze chemically-feasible behaviors efficiently for molecular structures with any size, shape and topology. The *eBGF generic methodology*, targets to realistically represent the intramolecular interactions, to minimize molecular conformational search and to speed collision detection queries. Finally, the proposed model can also be functional in areas such as molecular docking or assembly and protein folding where a rapid collision detection scheme for highly deformable objects is essential.

By Athina Brintaki
PhD. Candidate Industrial Engineering

RECENT PUBLICATIONS



- Okogbaa, G, Otieno, W., IIE Trans, Volume 40(10) October 2008, 971 – 983
- Savachkin, A., and Das, T." IIE Tran, 40(9), 2008, 893-905
- Brintaki, A., and Lai-Yuen, *SME Journal, NAMRC 36*(36), 153-160, 2008.

Upcoming USF Activities: Fall 2008

- USF Bull's Football Schedule: NC State (Sept 27), Pittsburg (Oct 02), Syracuse (Oct 18), Louisville (Oct 25), Cincinnati (Oct 30), Rutgers (Nov 15), UConn (Nov 23), West Virginia (Dec 03).
- INFORMS Member volunteering at the Gandhi day of service (Oct 4)
- USF Home Coming week: Oct 13-18
- University Lecture Series (ULS) Present Ben Stein on Life: Nov 04,
- ULS & CCEV Present Hoops of Hope Key note Address by Austin Gutwein
- Thanks giving weekend: Nov 27-29

I♥SE . . . (Contributed by Dayna & Alcides IMSE PhD. Students)

The purpose of this new column in The OR Times is to get to know a different side of our department faculty members and students. So be ready to get interviewed by one of our committee members.

Our first interviewee is Dr. José Luis Zayas-Castro, chair and professor of the Industrial and Management Systems Engineering department. Most likely you know that some of his research interests are enterprise change, healthcare engineering, entrepreneurship, applied statistical analysis and economic/cost analysis. However, there is a lot you don't know about our chairman.

What your family members do?
My wife is assistant professor of accounting at USF-Sarasota, my daughter (Teresa) works for AHRQ program, my son Gabriel is studying a Ph.D. in OR at Cornell and my older son, José Antonio, is pursuing his artist degree in Music with emphasis in saxophone.
Favorite restaurant in Tampa?
La casona.
Besides your students/major professor, who's your favorite student/professor?
N/A
Your favorite actor and/or actress?
Anthony Hopkins.
Your favorite music?
Salsa, Ruben Blades
What where you doing when you decided to pursue your Ph.D?
I was finishing my bachelors at University of Puerto Rico at Mayaguez
Your favorite color?
Beige, Tan
Favorite sports to play and to watch.
Baseball
Favorite vacation destination
Puerto Rico
Wine or beer?
None of them… gin with tonic and lime
As a student, what was the class you disliked the most?
Material Sciences
Favorite movie
One flew over the cuckoo's nest; Gandhi.
Do you have any hobbies?
Watching sports and listening music
What would you like to do after retiring?
Keep working
How do you see the department in five years?
I would like to see it stronger in its graduate and undergraduate programs.
Did you have a nickname in High School?
Pigue and Tito
Dinner at home or at a fancy restaurant?
Dinner at home
If you could make a wish, what would you wish for?
World Peace and health for everybody
What person do you like to meet?
Jesus, someday…
NYC or Tampa?
Tampa
Favorite auto ?
Toyota

INFORMS Annual Meeting Washington DC. Oct: 11-15, 2008…(compiled by the editor)

Andres Uribe: (Oct 14, 4:30-6:00 pm)

Developing Federal Resource Allocation to mitigate Cross-Regional Pandemic Outbreaks

Alcides Santander: (Oct 12, 8:00-9:30 am)

Time Series Analysis of Lab Test Results to Prevent Adverse Patient Outcomes

Aldo Fabregas:(Oct 12, 8:00-9:30 am)

Simulating Public Involvement in Capacity Expansion Models in Transportation

Chaitra Gopalappa: (Oct 15, 8:00-9:30 am)

A Multi-Agent Modeling Approach to Decision Making for Intervention of Colorectal Cancer

Dayna Martinez: (Oct 15, 11:00-12:30 pm)

An Economic Sequential Probability Ratio Test (ESPRT) Model to Detect Epidemic Outbreaks

Diana Prieto: (Oct 11, DM-HI Workshop)

A Cross-Regional Pandemic Outbreak Simulation Model: An aid to National Resource Allocation Policy Making

Laila Cure:(Oct 13 ,11:00-12:30 pm)

Risk Identification, Assessment and Monitoring in the Delivery of Health-Care Services

Ozan Ozcan: (Oct 15,11:00-12:30 pm)

Enhancing Cumulative Innovation by creating Social Ties Within Col laborative Networks

Vishnu Nanduri & Patricio Rocha

(Oct 14, 4:30-6:00 pm):

A Decision Support Tool for Generation Capacity Investments in Re structures Power Markets

Abhik Bhattacharya: (Oct 12, 13:30 - 15:00 pm)

Modeling Flow for Patients Undergoing Lung Resection at a Tertiary Care Teaching Hospital

Visit http://meetings.informs.org/DC08/

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