Newsletter

Operations Research Society of South Africa
Operasionele Navorsingsvereniging van Suid-Afrika

June 2011

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FROM THE EDITOR

Contactable at: 14556561@sun.ac.za

Danie Lötter

Greetings to all ORSSA members. First of all, ORSSA regrets to announce the passing of John Lawton, a long time member of ORSSA. This edition starts with the usual column from the president's desk, followed by an obituary of John Lawton on page 3. I have included a new announcement column in this edition for general announcements. This may be found on page 2.

The featuring article in this edition is by Jason Matthews and Stephan Visagie from the University of Stellenbosch titled: "Crane Optimisation in a Distribution Centre". The member interview is conducted with Ian Durbach from the University of Cape Town who is, by the way, the newly elected Database Manager of ORSSA. This edition concludes with an interesting Book Review by Hans Ittmann titled: "Herding Cats".

I would like to bring it to everyone's attention that the ORSSA website has been upgraded. A huge thanks to Jan van Vuuren and Martin Kidd for this. Part of this upgrade included the newsletter page on the website. For those members who are interested, all newsletter copies are now available online in electronic form. These may be downloaded from the ORSSA webpage. Please visit *www.orssa.org.za*
Enjoy☺.

Features

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QUERIES AND CONTRIBUTIONS

Any queries and contributions to the newsletter are most welcome, especially article submissions. Please contact the Newsletter editor in this regard:

Danie Lötter
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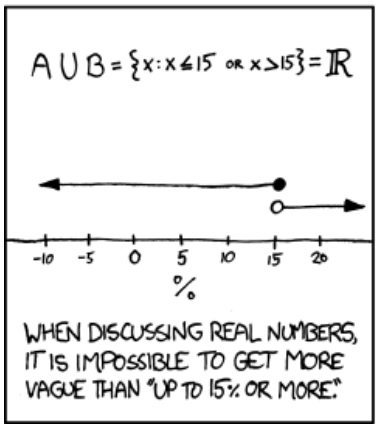

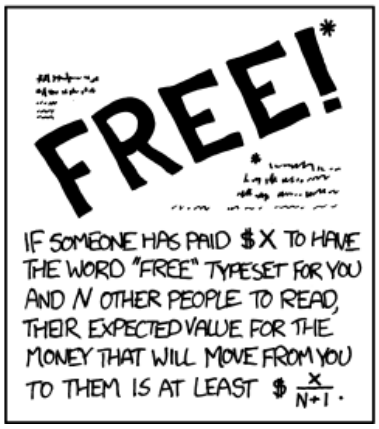

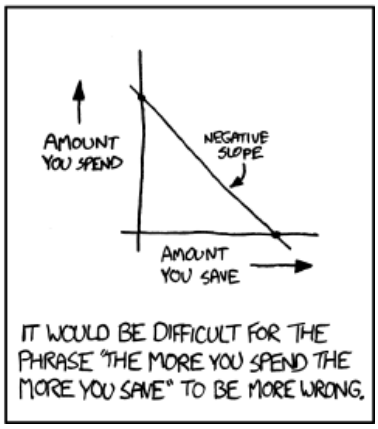

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FROM THE PRESIDENT'S DESK

by Dave Evans (davee@dbsa.org)
ORSSA President

As I indicated in the last Newsletter, our upcoming national conference is the 'event of the year', even more so than usual, as we are holding it at the Elephant Hills Hotel, Victoria Falls in Zimbabwe this year – the first time our conference has ever been held north of the Limpopo. It is not the first conference we've held outside the Republic's borders – the 1996 conference was held very successfully in Swaziland. Bookings are now flowing in, and I recommend all our members to attend, both to make it a success in itself, and to offer our Zimbabwean OR brethren support, in their attempts to get a Zimbabwean OR society off the ground. The Local Organising Committee is being provided by the National University of Science and Technology in Bulawayo, and they have been considering the establishment of a society for some time, but with the problems which their country has faced in recent years, the launch has not yet taken place.

In holding the conference in Zimbabwe, we hope to attract participants from a wider range of southern and, indeed, all African OR communities, and accelerate the awareness of the value, and application of OR for the continent.

It will take place from 18th to 21st September 2011, with 22nd September reserved for sightseeing. All details are on our website, and also elsewhere in this Newsletter.

I'd now like to change direction totally, and lob what seems to me a fascinating pebble into the bushes. Some of you may have already come across the concept of the 'Singularity.' It's a singularly inappropriate label in my mind (excuse the pun) and refers to the point in the future when artificial 'non-human' intelligence converges with and/or runs ahead of human intelligence. It could well include a 'combined' intelligence, with artificial bits (think computer chips) plugged into human brains. Eliezer Yudkowsky (*http://yudkowsky.net/singularity/*) is one of the people studying this area, and he and others have some very disturbing thoughts about it. That link is a good place to start if you want to read more.

One could argue that human evolution has been a balancing act between what is good for oneself/small groups (i.e. selfishness) and what is good for larger group (which takes us into ethical questions of morality, etc.) Intrinsically, inorganic, 'artificial' intelligence (AI) will have none of the emotional, or human evolutionary, history to take into such questions when it gets to a level when it can consider such issues. Indeed, whether it will develop its own 'emotions' is a fascinating question in itself. Some people believe we will be able to programme 'our' morals into such intelligent machines, but there is a significant amount of research and thinking which suggests that that is real pie in the sky. One of the characteristics of such an intelligent machine is that it will be able to start designing much more intelligent versions of itself, orders of magnitude faster and better than Darwinian evolution improves flesh and blood organisms such as humans.

ANNOUNCEMENTS:

APOLOGIES:

I would like to send out a word of apology to the EURO representative of the society, Theo Stewart. He was accidently omitted from the 2011 Exec list which was published in the March 2011 issue of the newsletter – Editor.

DATABASE MANAGER:

The society would like to congratulate Ian Durbach, who was elected as the new Database Manager of the Society.

NEW MEMBERS:

ORSSA would like to welcome the following new members to the society:

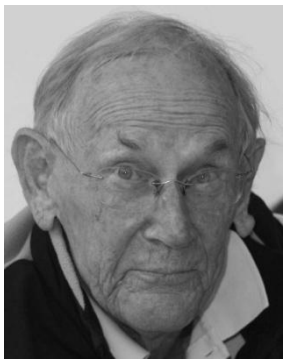
Mr Thando Sambo
Mr Richard de Beer
Mr Irshaad Vawda

Anyone who has read much science fiction will be familiar with Isaac Asimov's laws of robotics. In his robot stories, these provide absolute constraints which robots can't break, that make sure that they 'look after' humans. They also provide a framework for some really neat 'detective' stories; I recommend them to anyone who is not familiar with them, but I digress. These new, super-smart AI machines will very quickly work out how to bypass any kind of 'moral' constraints we try to programme into them. Indeed, the first 'mind' that gets that smart may well define the future: as Yudkowsky puts it: "The future of Earth-originating intelligence may be determined by the goals of the first mind smart enough to self-improve", because the first one which does get that smart may well run away from whatever is trying to follow. Note that the way this is all phrased carries a very real innuendo that this self improving mind will be at the very least, partially machine…

So what has this got to do with ORSSA? In some senses, nothing. On the other hand, somewhere in the not too distant future, it is going to impact every flesh and blood human on the planet. As you know, global warming is a hobby horse of mine, which already comes into that category. As I've said before, unless humanity makes serious attempts to ameliorate what it is still doing to the climate, our children's children will curse our generation to their graves. And sadly, there is every chance that many of them will go to those graves at a much younger age than my generation, because of the effects of global warming. It may even come unstuck badly enough and quickly enough that it will be our children cursing us – not their children. The 'Singularity' may well be considerably more dramatic: depending how these super-minds behave towards us, our future could be very limited. Yes – it sounds like 'conspiracy theory' drivel, doesn't it? I'm now of the view that it isn't – it is very real. OR and AI are not that far apart. It's a topic which should be of interest to every thinking person on the planet, and if you are an Operations Researcher who's looking for a new area to get into, I strongly recommend having a look at this one. Our OR training provides ways of structuring and addressing problems which should be very applicable.

OBITUARY: JOHN C LAWTON

by Hans Ittmann (hittmann@csir.co.za)



John Lawton

It is with great sadness that the OR community in South Africa took note of the passing away of one of its stalwart members, John C Lawton. He passed away on 11 June 2010 after his health deteriorated over a number of years. We received news about John's passing only very recently and therefore deem it very fitting to honour the memory of one of ORSSA's esteemed members. John Lawton was born on 18 February 1940 in Radcliffe, Lancashire in England. This was during WWII, a very difficult time to grow up, with severe shortages of food stuff and other commodities, and many hardships. When John was 8 years old, his family came to South Africa by ship to make a fresh start and create a new home for themselves.

After school John studied land surveying for a short while before changing to mathematics. He graduated with a BSc majoring in mathematics from the University of Cape Town (UCT) in 1963. His first job was with Truworths, after which he moved to Johannesburg to do an Honours degree in statistics at the University of the Witwatersrand. While completing his Honours, he worked for the Chamber of Mines in Johannesburg and then moved to Vereeniging where he worked for Stewart and Lloyds. In 1969, John and his wife returned to Cape Town where he started a career at Engen (then Mobil Oil SA). His career at Engen spanned many years and even after starting his own CC in 2000, John continued to consult for Engen.

John was one of the founding members of ORSSA and it was during his years at Mobil, especially in the 70s and 80s, that John played a significant role in the activities of the Western Cape chapter of ORSSA and in ORSSA at a national level too. As early as November 1973, John was the chair of a session at the ORSSA conference held at Unisa. On 5 March 1974, at a chapter meeting, John was elected chairperson for the Western Cape chapter. Thereafter he was involved in the chapter committee in a variety of positions.

I personally got to know John reasonably well during the annual ORSSA conferences. He was a real gentleman, very friendly and always had time for interaction with colleagues. John presented a paper at the 1982 conference that was held in Rustenburg at the Wigwam Motel. The paper was titled "A Purchasing Problem". Those days one was expected to prepare a full paper for the conference and it was published in the conference proceedings!

It was for that paper that John was awarded the Tom Rozwadowski medal of ORSSA in 1983. As is the case today, the medal was awarded annually for the best written paper published during the previous year.

In September 1984 John presented a talk on "A Purchasing Problem - A Decision Support Approach", based on the award winning paper, at the Western Cape chapter of ORSSA. At that time John was the operations research manager at Mobil Oil SA (Pty) Ltd. The project can be summarised as follows, based on his paper: Mobil markets a group of products. The costs of the components change in discrete steps depending on the amount purchased. Thus, if a volume between 0 and V_1 is purchased, the price will be x per unit while if a volume of between V_1 and V_2 is purchased, the price will be y ($y<x$). In addition, the suppliers sometimes offer discounts ranging from 1-5%, depending on the total amount purchased from the supplier. These again are usually in discrete steps. Hence selecting the best (cheapest) way of manufacturing the product range is not simple. We can only calculate the cost according to each formula and thus select the cheapest for each product after we know the amount of each component and the total amount to be purchased from each supplier.

The problem was formulated as a large-scale integer programming (IP) problem which also involves subjective managerial preferences. The solution was an interactive system which, while solving the IP problem, allows the user to explore the consequences of his subjective preferences. Impressive stuff!

John had a wide and varied general knowledge, a keen intellect and a quick, dry sense of humour. Later in life he enjoyed playing a variety of board and card games with his family, including backgammon and bridge. He taught them to lose graciously, not by example, but by beating them solidly in every game they played! Crossword puzzles were also a favourite pastime and he loved Sudoku. John believed and lived by the motto that anything worth doing is worth doing well. He had high standards, strong principles, a strong sense of occasion and protocol required in different situations. He had no patience with laziness or shoddy work. Furthermore, he was a private person who generally kept his emotions to himself.

Even though ORSSA's condolences are expressed quite a long time after his passing, our thoughts are with his wife, Anne, his two daughters and their families. John will be sorely missed by the OR community in South Africa. He was a truly outstanding individual and epitomised everything that operations research represents!

(I would like to express my sincere appreciation to Su Crowson, one of John's daughters, for her assistance in providing very useful information that enabled me to write this obituary.)

International conference on Operations Research

August 30 to September 2, 2011

Zurich, Switzerland

All members of the OR/MS community are invited to participate in the OR 2011 in Zurich, Switzerland.

The main goal of the conference is to bring together members of the international OR community to discuss scientific advancements in various subfields of OR in a truly interdisciplinary spirit. The highlights and core of the conference are the presentations of the invited Keynote Speakers and the parallel semi-plenary lectures on various topics representing the state of the art in these fields.

Numerous sessions will focus on OR applications in industry and, in turn, on new problems stemming from industry applications that pose challenging tasks for future scientific design.

Please visit the following website for further important information:

http://www.or2011.ch

Crane Optimisation in a Distribution Centre

by Jason Matthews (14855054@sun.ac.za) and Stephan Visagie (svisagie@sun.ac.za)
Department of Logistics, Stellenbosch University

Introduction

Pep is the largest single brand retailer in South Africa employing over 15000 people with over 1500 clothing stores, in 10 Southern African countries. It predominantly sells apparel but also sells other products ranging from cell phones to home décor. Pep also owns and runs the largest clothing factory in Southern Africa. A major contribution to Pep's success is its effective supply chain. Pep's supply chain makes use of several *Distribution Centres* (DCs) with the largest of these situated in Durban and the second largest in Kuilsriver. During 2009 the Department of Logistics at the University of Stellenbosch collaborated with Pep to work on a project in their Kuilsriver DC.

DC Operations and Layout

The first major operation within the Kuilsriver DC is the receiving and storage of goods that are received and offloaded from containers and trucks and placed in storage racks for later use. The second operation within the DC is order picking. An order may be viewed as a request by a customer for a selection of distinct goods at specific quantities. The order picking operation consolidates inventory received from suppliers to satisfy the orders. It is the most cost intensive and time consuming operation within the DC. The order pick operation in the Kuilsriver DC requires the manual unpacking and re-packing of individual *stock keeping units* (SKUs) from larger cartons into smaller cartons to fulfil order demands. The final operation is distribution, which consolidates, prepares and packs the newly packed cartons for transportation to branches.

Pep has a fixed set of customers/branches which their DCs serve and thus utilises a philosophy of wave picking. A wave may be seen as a set of SKUs in conjunction with all the requests by all branches for those SKUs. The SKUs in a wave are completely picked for all branches in a single batch. All branches receive the same stock at similar times. In the DC this operation relies on the use of a picking line. A picking line may be viewed as the set of SKUs, associated with a wave, arranged around a conveyor belt leading to distribution areas. Pickers take empty cartons and move around the conveyor belt picking SKUs and placing it in the cartons. Packed cartons are placed on the conveyor belt. A key process in a wave of picking is the movement of SKUs from storage racks to build these picking lines and to replenish low stock levels on functioning picking lines. After a wave of picking is completed the leftover stock needs to be moved back to storage. All the movement of stock to and from picking lines are performed by means of cranes. The picking lines form the bottleneck in the DC and the movement of pallets to and from picking lines should not hinder their performance.

The Kuilsriver DC has a static layout with several fixed storage racks which act as supports for the roof. These storage racks can therefore not be moved even in the long term. Figure 1 illustrates the layout of the DC with floor space allocated for the receiving of goods, the distribution of cartons, and the storage of full cartons which will be directly shipped to the branches.

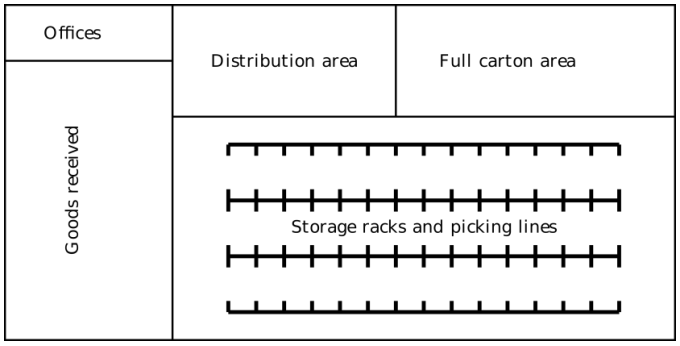


Figure 1: A schematic representation of the floor layout of the Durban DC.

The majority of the space is taken up by the storage racks which are used to store goods and run picking lines. There are four sets of storage racks with picking lines built into the middle racks. The photograph of a picking line in Figure 2 shows an empty picking line. The bay locations, where SKUs associated with a wave, are stored on the left and right of a conveyor belt running

to the distribution area can be seen. Pickers move around the conveyor belt picking items from the bay locations. There are three such picking line levels with seven additional levels above used for storage within the middle storage racks. The outer storage racks only have ten levels for storage.

Figure 2: A photograph of an empty picking line showing the conveyor belt in the middle and the bay locations to the left and right of it.

Picking lines are active for 8 hours per day, however, the DC runs on a 24 hour basis making use of nightshifts to build and dismantle picking lines as well as to store stock. Ideally all the picking lines scheduled for the next day should be built the night before and the required floor space in goods received cleared for the next day's deliveries.

Figure 3: The fixed rail down an aisle on which a single crane operates.

Problem Description

The warehouse management system does not optimise the process of moving pallets of stock to and from picking lines. The moving of pallets has in some cases become the new bottleneck and an optimisation tool is therefore required. There are two main factors influencing this problem: the physical layout of the DC limits and the actual equipment. The only point of access to a pallet is via the aisles between storage racks each with a crane fixed to a rail in the floor and ceiling. A crane can only move along one aisle and can access storage locations on both sides. In Figure 3 a photograph down an aisle shows the railing of the crane visible on the floor with storage racks situated on either side. Because of this fixed crane system inefficiencies in a crane's movements cannot be compensated for by using additional cranes. Pallet movements, or jobs, revolve mainly around the activities of storing goods and the building and dismantling of picking lines.

A storage job may be viewed as the movement of a pallet from the floor to a storage location. For a pallet to be picked up by a crane from the floor a pump trolley is used to place pallets on specially assigned docking bays at the base of each storage rack. The crane then comes down to the base of the rack to retrieve the pallet. Pallets can also be moved between racks by means of these docking racks. A schematic representation of a representative set of jobs performed by a crane is shown in Figure 4.

The philosophy of the DC is to concentrate all efforts of a crane into completing all jobs required by one of the following activities: building a picking line, dismantling a picking line or storing a set of received pallets before moving to another activity. The crane thus completes sets of jobs associated with a single activity. Only once the set of jobs has been completed can a new set of jobs for another activity be started. There is therefore limited or no integration between jobs of different activities. For example, if a scenario occurs where twenty building jobs need to be completed before the picking can commence and twenty pallets need to be stored from the goods received floor (storage jobs), the crane would either first complete all twenty building jobs before starting the storage jobs or *vice versa*. Furthermore, no optimisation is performed to schedule

HARNESSING THE POWER OF DATA TO OPTIMISE BUSINESS RESULTS

Francois Beyleveld

Francois Beyleveld, at SAS, explains why sustainability as a concept offers a watershed of opportunity for better business performance through innovation, while also benefiting the planet and employees' own careers.

More and more South African companies are beginning to realise that 'greening' their IT infrastructures brings greater business efficiency, return on investment and improved levels of service to their organisations.

In fact, organisational performance as we know it, demands sustainability measures across social, environmental and economic factors, which in turn requires the vital steps of integrating and analysing data to achieve new goals and transform internal organisational cultures. Technology companies in particular are at the forefront of green IT initiatives, because they acknowledge that their reputation as socially responsible entities is critical.

The right choices

By deploying the right technologies, IT can play a significant role in furthering a company's ability to monitor, analyse and implement more sustainable, or green practices, defined as those that meet the requirements of the present day without compromising the ability of future generations to meet their needs. In many cases, making small, incremental changes in IT processes can lead to definitive benefits.

When it comes down to the practicalities of doing business in an increasingly energy-hungry world, most companies are now looking at their supply chain and their ability to measure, monitor and improve their efficiency footprint within their organisations. Those that cannot demonstrate that value, might find themselves out in the cold when the next tender request comes around.

Another aspect that is becoming more important in green IT is employee retention and recruitment. Talented employees have many employment options and are increasingly looking at their employers and their stance on corporate responsibility and the environment. Clearly, reducing energy use is more about being environmentally responsible. To ensure their long-term viability, organisations must begin now to find and implement solutions that decrease power consumption.

The tools

The good news? Many of the same tools and practices that have enabled these organisations to reduce IT complexity, streamline operations and controls are also highly effective in energy use to help companies become lean, clean and green organisations. These include data de-duplication, high availability and virtualisation, power management and energy efficient data centre design.

The most strategic enterprises will use data, and the intelligence gained from it, to their competitive advantage – driving increased brand value through innovation and improving internal efficiencies and accountability. They will also build loyalty in consumers, employees and other stakeholders – such as in higher education where they track, communicate and educate on sustainability.

Today, companies are able to measure, manage and report on the Triple Bottom Line – environmental, social and economic indicators – and determine business strategies to reduce risk and increase shareholder value.

The results

Harnessing sophisticated software, companies are able to measure key sustainability activities using methodologies and protocols, utilising their existing data in operational systems and databases.

They are also able to report ongoing performance to ensure transparency with key stakeholders and compliance with regulatory agencies. By establishing an integrated, consistent source of quality information, companies can bind initiatives to a common sustainability framework that allows alignment across all lines of business – from water treatment facilities to the data centre,

Additionally, companies are able to improve performance by identifying metrics that have the greatest impact on goal attainment so that they can make the most informed strategic decisions by using optimisation, forecasting and data mining capabilities to analyse scenarios and run simulations to improve response and successful strategy execution.

Organisations can also manage and forecast the finances and resources needed to achieve the desired outcomes across the enterprise and within each department. Using analytics, they are able to prioritise organisational strategies and align investments in new product innovation, programme management and talent accordingly and establish scorecards and strategy maps driven by the sustainability goals of the organisation.

To end

In closing, going green offers a vital path to innovation and creating enduring value and competitive advantage. Despite the challenges of adopting an environmental mind-set, the direction that companies have to head in is clear, and it is clear that IT has a key role to play. When people start understanding the strategic risk and strategic opportunities of climate change in terms of its impact on brand value, their market and their operations, they'll get engaged in a much broader environmental agenda.

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these individual sets of jobs. In addition there may also be a situation where a functioning picking line runs out of a product, forcing the picking line to a halt. The crane which services that storage location must replenish this stock as soon as possible. This forces all other jobs to be delayed until the replenishment job is completed.

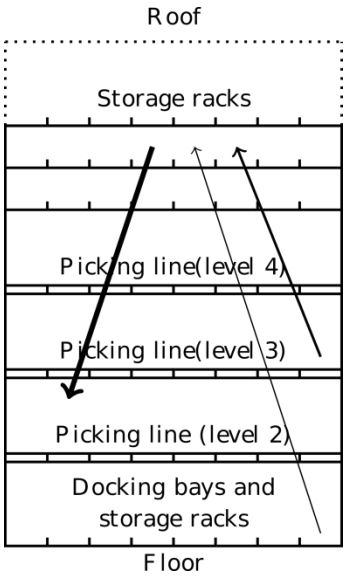

Figure 1: A schematic representation of deferent jobs performed by a crane. Building jobs are indicated by the thick black line, breaking jobs by the medium black line and storage jobs by the thin black line.

The presence of emergency replenishment jobs and the fact that cranes run continuously on a 24 hour basis causes the list of pending jobs to change regularly. Any optimisation tool must therefore be able to handle these real time changes in information. Another complication is the inclusion of job deadlines which must be taken into account. For example, all jobs associated with the building of a picking line must be completed before the scheduled start of that picking line. Similarly if a container of stock is arriving at a specific time, floor space in the goods received area must be cleared before the arrival.

Model and Results

The problem may be viewed as a dynamic version of the *sequential ordering problem with deadlines* (SOPD). Each job is scheduled for its crane ensuring that as many jobs as possible meet their deadlines. In addition there may be precedence constraints ensuring that pallets can only be placed in empty storage locations. For example, before a pallet may be placed in a picking line the job which cleared that location must be completed.

In order to handle the real time dynamic system a re-optimisation procedure was used, where an SOPD was solved whenever the information regarding pending jobs changed. Exact solution techniques were found to require too much computation time to be used for re-optimisation in real time and metaheuristic methods were developed.

Four metaheuristc methods were developed to solve the SOPD, namely a Tabu search, an Ant colony optimisation scheme and two hybrid methods. The first hybrid method sequentially passed information, regarding solution quality, between the Tabu search and Ant colony algorithms. The second hybrid method called the Ant colony algorithm only once to generate a good solution for the Tabu search. It was found that for static problems both hybrid methods marginally outperformed the Tabu search with the Ant colony algorithm showing the worst performance. Unfortunately the Ant colony algorithm, which is also used in both hybrid methods, relies on parameters which would need to be set for varying sizes of static SOPD instances and was therefore not ideal for dynamic instances. It was therefore decided that the Tabu search algorithm should be used.

To test the dynamic re-optimisation approach a real time simulation was developed. The simulation had three components, a dummy systems operator, a job scheduler and a dummy crane. The dummy systems operator would simulate the control centre of the DC inputting new jobs into the system at predetermined times with specific deadlines. The dummy crane would simulate, in real time, the time taken to complete jobs. The job scheduler had three actions:

1. The insertion action would place any new jobs into the current schedule trying to ensure it would be scheduled to be completed by its deadline.
2. The release action would pass the information of the first job in the schedule to the dummy crane.
3. The re-optimisation would continuously take place trying to find a feasible schedule which has a shortest expected completion time. If new jobs are inserted or a job is released a new version of the SOPD is produced and optimised.

To test the simulation dynamic data instances were generated based on real historical data. The proposed re-optimisation procedure was compared to Pep's philosophy. A summary of the expected percentage improvement of overall job completion times if the re-optimisation procedure is used is given in Table 1. Four different sets of jobs were used and for each set four different experiments were run. Experiment 1 simulated a static problem where all the jobs, except emergency jobs, were known in advance. Experiment 2 simulated a dynamic scenario by dividing the set of jobs into subsets of the same type. An initial subset of jobs was known and after a small percentage of each subset was completed a new subset was inserted. Experiment 3 was done in a similar way; however, a large percentage of each subset was completed before a new subset was inserted. The last experiment simulated the current approach in the DC where each subset was completed independently of the others. The experiments clearly show that new jobs should be included into the optimisation procedure as soon as they are available to achieve the best total completion time.

Job Set	Exp 1	Exp 2	Exp 3	Exp 4
A	10.81%	7.98%	7.46%	5.70%
B	18.83%	14.02%	12.31%	9.61%
C	10.57%	7.73%	7.02%	4.86%
D	4.51%	1.75%	1.75%	0.95%

Table 1: The percentage improvement on total completion time after optimisation was performed on data sets based on real life data.

In conclusion it is suggested that Pep further investigate the use of a dynamic re-optimisation tool for their warehouse management system to schedule pallet movements within their DC as their current warehouse management system cannot accommodate the optimisation tool presented here due to the unavailability of real time data changes regarding the crane movements and job completions.

Stephan Visagie and Jason Matthews.

MEMBER INTERVIEW: IAN DURBACH

Contactable at: ian.durbach@uct.ac.za

Ian Durbach

Ian Durbach was born in 1979 and grew up in Cape Town. He graduated with a BBusSc (hons) from UCT in 2001, specializing in quantitative management and an MBusSc in operations research in 2003. Between 2003 and 2005 he worked as a statistician for the Customer Equity Company, a market research company based in Cape Town. In 2005 he joined the Department of Statistical Sciences at UCT as a lecturer, where he works now, consulting occasionally to the market research industry. He joined ORSSA in 2007 and is an additional member of the current executive committee. In 2011 he obtained his PhD from UCT for a thesis entitled "Simplified models for multi-criteria decision analysis under uncertainty".

When and how did you first become involved in ORSSA, and what aspects of ORSSA do enjoy the most as a member?

I joined ORSSA in 2007 although I think I went to one or two conferences before that. I had been working at UCT in the Department of Statistical Sciences for a couple of years before I decided to concentrate fully on OR. Joining ORSSA seemed like a good place to start. I like that there's a small but strong OR community in South Africa. The conferences I've been to have all been great, and it's always nice when ORiON arrives in the mail.

What do you think about ORSSA's role in promoting OR in general, and how do you think the society is keeping up in terms of achieving this goal both locally and internationally?

Promoting OR is tough for an organization – it's a very broad subject and it doesn't have the history of other quantitative sciences to draw on. The best promotion is done by people who get out there and solve important problems, and then identify what they've done as OR. I think ORSSA does a good job at recognizing good work, but might be more proactive in sourcing projects – I'm

not sure how though. One sometimes hears about OR needing to get involved in the "big problems" of today – things like poverty alleviation, good governance, and climate change – in order to promote itself. I think tackling these problems in South Africa is going to need groups of operational researchers working together, and so perhaps ORSSA's main role is to bring OR people into regular contact with one another so that they can form these collaborations. I think ORSSA does an excellent job at promoting South Africa's standing in the international OR community.

Can you tell us more about OR at UCT in terms of courses available, course prerequisites and current student numbers?

OR is located in the Department of Statistical Sciences at UCT, and unfortunately there is not much OR in the undergraduate curriculum: students who choose to do 'applied statistics' do one semester of OR in their 3rd year. Currently there are around 40 students. There are two compulsory modules in our 4th year (honours) program covering general OR, and a decision modelling module which is sadly optional. Typically 10-20 students take these courses and one would need to have done a 3-year undergraduate program in statistics (or similar) to qualify for the program, although students from other disciplines can take some of the modules. For some time we offered an MSc in OR for development but it was difficult to attract enough students to be viable. This was a real pity because I think it was a unique offering, involving a year of coursework based on readings of OR case-studies before students got involved in their own real-life application. Many of these applications were interesting but messy and complex OR problems with a strong development flavour. Unfortunately enrolment was typically only a couple of students per year and the course was discontinued in 2010. I hope it can be resurrected in the near future!

You have recently been involved in a soft-systems modelling project within the South African energy sector. Can you tell us more about the project, and specifically the highlights and challenges of the project?

This was part of a bigger project done at the Energy Research Centre at UCT on attempts to reduce energy consumption. It was a first attempt at building a preference model explaining some aspects of household energy use. A lot of research around energy consumption focuses solely on cost: quite technical analyses of price elasticities and so on. For us it was important to highlight the multi-criteria aspect of the problem – that people are trying to balance objectives on cost, comfort levels, and (hopefully more and more) limiting their impact on the environment. This was the challenge – to confront an established point of view, which I think we did reasonably successfully. For me personally, I had to learn about system dynamics more-or-less from scratch, which was a challenge but an enjoyable one.

Please share with us your views on the interaction between and potential benefits of combining elements from a soft systems approach and a more traditional hard OR approach when faced with a real world OR project.?

I haven't been involved in many real-world OR projects but in all of them it was critical that the client understood and participated in each stage of the process. Also I think most real-world problems are really collections of several problems and, unless one works in a specialized area where OR is taken for granted, maybe something like vehicle routing, there needs to be a discussion around which of the problems are going to be solvable in reasonable time and give the most benefit to the client once they are solved. It has been useful to know something about soft OR methods to help with these discussions.

Have you recently been involved in any other interesting OR related projects and could you give us some brief details?

I've been working again with colleagues at the Energy Research Centre at UCT on designing decision support for generating shortlists of promising electricity-saving options for households in South Africa. The problem is that there is very little concrete information, both about what people want and the performance of potential electricity-saving options. So we've used a methodology called stochastic multi-criteria acceptability analysis (SMAA) which basically allows you to simulate across all these uncertainties and come up with some ranking of the alternatives on offer. I've got a student using the same methodology to rank rugby players! Mostly at the moment though I'm taking a

break from the real-world and am just looking more generally at how uncertainty about what will happen in the future affects the trade-offs that people are willing to make in decisions that have to be taken now. I'm hoping that I'll be able to apply this research to decisions around energy consumption, an area where I think uncertainties are partly responsible for us taking some very short-sighted actions with potentially disastrous long-term consequences.

What has been the most memorable OR event for you as an individual?

All the OR events I've attended have been conferences and these have all been memorable either for their location or the people I met there or a good talk I listened to. I thought last year's ORSSA conference in Limpopo was the most memorable local event I've been to, a very successful break from convention and in a fantastic location. All in all though it would be hard to top a conference I went to in 2007 on multi-agent systems in Hawaii. It was mid-summer, the conference venue was a block from the beach, and (maybe surprisingly) the conference talks were really interesting too. One thing I picked up there was that smaller, more focused conferences are usually more enjoyable than the huge ones, where it's difficult to just bump into people who work in similar areas to you and you can be left feeling a bit anonymous.

What message or advice can you give other young aspiring OR practitioners?

The best advice I've received is to try and make contact with as many other disciplines as you can manage. I think OR is, or should be, a subject in service of other subjects, so I try to attend seminar series in other departments, find out about what problems are important to them, speak to people and collaborate on something that is important to them and interesting to me. This kind of approach almost inevitably seems to opens up more theoretical questions that can be worked on later in "closed office door" mode, plus you've got to solve a real-world problem in the process of getting there. I've found this to be a really enjoyable and productive way of doing academic research, but I imagine it would also work well in the commercial world.

BOOK REVIEW : HERDING CATS

By Hans Ittmann (hittmann@csir.co.za)

Herding Cats – Being advice to aspiring academic and research leaders **by Geoff Garrett and Graeme Davies, 2010, Triarchy Press, Devon, UK, pp. 118. ISBN: 978-0-9565379-5-9. 21.06 US dollars.**

Every so often one reads a cameo of a book that you just need to share with others. ***Herding Cats*** is such a book. The book is not about operations research. However, the topic is something many will be able to associate with and appreciate. There are many operations research professionals who are academics and researchers in institutions worldwide. These institutions have one major characteristic namely those employed in these institutions "like to exercise as much independence as possible in their professional lives". All of them consider themselves to be professionals in their own right, they know better than anyone else and typically have strong views. In addition they operate very much like "cats". ***Herding Cats*** is thus an appropriate metaphor used as the title of the book since "*Cats will not be commanded and can choose their owner*" (Cats by Valeria Manferto De Fabianis (ed), 2007). How do you lead and manage "cats" in such research and academic institutions?

Garrett and Davies have between them many years of experience in managing or leading international academic and research institutions. Their experience and wisdom have been gleaned from their involvement in institutions in South Africa, Australia and the United Kingdom. In writing the book they also approached a number of senior leaders, whom they knew from across the world, for their inputs as well. This was done through posing a number of questions requesting inputs as well as quotes or words of wisdom, some 50 people responded. In short the questions were:

- What do you know now that you wish you had known 'back then'?;
- If you are mentoring a new leader what would you wish to share concisely about 'operations' ....about 'strategy'?;

- What are your favourite 'war stories'?; and
- What, in your opinion, brings out the best (and worst) in your people?

The format of the book is fairly novel as well. The authors provide the text on various topics, their own views and then they present the wisdom from the leaders that submitted their inputs. There are also quotes from famous people and finally Garrett and Davies offer what they think, their views, and insights, on the topic. This makes reading the book easy, one can start anywhere and it is not necessary to go through it from beginning to the end.

The framework of the book is a short introduction, four sections or chapters and then a postscript. Each chapter has a number of subsections, each containing a specific aspect of the main chapter topic. The subsections all have a single word capturing the essence of what is presented. Each of these words starts with a "C".

Understanding the culture of an institution is presented in section A. Culture is a critical aspect of organisational life and describes 'the way we do things around here". The subsections are titled "Aspects of the Culture", "On Conflict" and "The difficulty of Collaboration and boundary crossing". Under each heading the issue is presented and various perspectives are presented. The issues highlighted under "aspects of the culture" include 'cats will not be commanded...', 'learning from history...', 'why are we here?', 'the political bias', 'talking straight' and 'bureaucracy rules, OK?'. A quote used in discussing bureaucracy is interesting: "*The biggest thing that I have found out through the years is that many people in research are actually bureaucrats. I would have expected them all to be interested in the future, wanting to change the world, brimming over with enthusiasm to get on with the job and deliver useful results. This took me a long time to realise and I think I would have been much more effective if I had understood that there are a lot of people who really do not want to see much in the way of change, and that includes a lot of R&D people*".

The next topic that is introduced and handled in detail is "Getting the Job done" and here the emphasis is on "taking Charge", "Composure under pressure and the implementation imperative", "Committees, etc." and "Managing the Cash". Section C deals with "Managing the People" that is so crucial in these organisations but also very complex. Everyone is considered "Colleagues not subordinates", while "Communication, Communication, Communication" is absolutely necessary as well as "giving Credit". From experience Garrett himself was a great communicator almost in the Ronald Reagan mode! Finally "Leading Strategically" is discussed under two main headings namely "Strategy is about Choice" and "Leading and Managing Change". Many a wise word is uttered throughout the text. It is certainly more difficult "to push "cats" to a destination than it is to tempt them to an outcome"!

One of the contributors to the guidebook summarises the essence of leading "cats" as follows:

I reckon there are five key dimensions to leadership in a research and development or academic environment....:

- *Research leaders must have a vision of where they want the organisation to go – because, if you don't, no one else will.*
- *You articulate it, and communicate it well, to get your people exited.*
- *You hire the best people you can find.*
- *You create the environment where they can excel, and succeed.*
- *You get out of the way.*

Finally a "checklist" for leadership in these types of organizations is presented. The "items" on the checklist are: culture, conflict, collaboration, charge (the taking of), composure, committees, cash, colleagues, communication, credit, choice and change. It is not a surprise that these are called the twelve C's, referring to the twelve subchapters addressed in the four chapters, and with a strong linkage to **C**ats!! Does this all work? The authors themselves indicate they merely provide advice and these twelve C's are certainly not "Commandments"! Nevertheless this guidebook is a very useful source for any leader or manager in a research or academic institution. Not only are the complexities associated with these institutions described and outlined, which is useful in itself, but advice from old hands who have "walked the road" can assist those new to the task and challenge.

This pocketsize guidebook is highly readable, it contains a huge amount of common sense and is also a very usable roadmap for those in leadership positions in what is a very tough and difficult environment. The authors have succeed in providing readers with an

understanding of the challenges of managing in organizations where conventional approaches do not necessarily hold and are almost surely doomed to failure. It is a great read!

(The reviewer was for many years a "cat" in the institution which was lead by Garrett and recently moved into "herding" people in the same organisation!)
(This review also appeared in the IFORS newsletter of March 2011.)

40th Annual Conference of the Operations Research Society of South Africa

Call for papers

"Spreading Operations Research Across Africa"

The 40th Annual Conference of the Operations Research Society of South Africa (ORSSA) will be hosted by the National University of Science and Technology, Bulawayo, Zimbabwe. The Conference will take place from 18th to 21st September 2011, with 22nd September reserved for sightseeing. It will be held at the Elephant Hills Hotel at Victoria Falls, Zimbabwe. In holding the conference in Zimbabwe, ORSSA hopes to foster greater collaboration and cooperation across southern African OR communities, accelerate the expansion of OR applications and education in Zimbabwe, and encourage the establishment of a Zimbabwean OR society.

With the theme of **"Spreading Operations Research Across Africa**,**"** ORSSA is moving in its stated direction and working to expand the awareness, understanding, and use of OR across the wider region. This theme encourages participation over the full spectrum of Operations Research, welcoming papers of a more fundamental nature, those on the application of Operations Research techniques in business and industry, about topical issues in Operations Research, and about the philosophy, teaching and marketing of Operations Research.

The keynote speaker at this year's conference is Prof Dag Ericsson of the School of Engineering at the University of Borås in Sweden. Professor Ericsson is an expert in demand chain analysis and will be delivering both the opening and closing plenary lectures at the conference. He will be delivering a fascinating account of the birth of Logistics as field of study during the 1960s an 1970s and the subsequent evolution of the subdisciplines of supply chain analysis and demand chain analysis during the 1980s and 1990s, respectively, as well as the "coming of age" of demand chain analysis during this century made possible by recent information technological advances. He will also focus on the necessary ingredients for a successful application of novel demand chain analytic principles in industry, and describe some cases in Swedish industry in which he has personally been involved in such technology transfer and change management.

Delegates are responsible for their own travel and accommodation arrangements. The Elephant Hills Hotel is strongly recommended, as the Society has arranged discounted rates for delegates. ORSSA is negotiating for reduced costs for airfares, and anyone who plans to fly to Victoria Falls and wishes to take advantage of these should contact the conference organiser. Please visit the following website for more information: ***www.orssa.org.za***

Important Dates Still Ahead:	**Deadline:**
4 July 2011	*Submission of full papers for peer-review closes.*
11 July 2011	*Early bird registration closes.*
29 July 2011	*Abstract submission closes for non-reviewed papers.*
22 August 2011	*Notification of Abstract acceptance for non-reviewed papers.*
1 September 2011	*Notification of acceptance of full papers*
15 September 2011	*Conference registration closes.*

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