



Message from the President - Kobus Oosthuizen

Automation and Control engineers is a diverse group, employed in a variety of industries, and utilising a wide skills set. Although a large portion of these engineers are employed in the chemical, mining and metallurgical industries, the mere fact that Automation and Control forms part of both Chemical and Electronic engineers' curricula, already results in differences in expertise, and, of course, subtle rivalry. Within the same industry, automation and control engineers may focus on instrumentation and industrial networks, R&D activities, modelling or implementation and maintenance of control systems higher up in the control hierarchy. Add to this control engineers' involvement in mechatronics, automotive control and aerospace, and the range of activities diverge even further. It hence comes as no surprise that a number of institutions has an interest in this field, and adds value to its members by participating in this space in its own unique way.

In this edition

Past events

The SACAC AGM was held at Forum Homini on 17 February and was well attended by our members and associates. We are pleased to announce the office bearers and EXCO.

Future events

There are two more exciting free evening talks planned for the year. Please view our events page for Workshops which are available on request. We are in full swing with preparation for the Control Conference Africa 2017 and registrations have now opened for conference attendance.

IFAC News

SACAC sponsored various authors to attend the 20th IFAC World Congress held in Toulouse in July 2017. Exco Member Dr. Brooks was part of the South African contingent attending the IFAC General Assembly.

Member updates

Congratulations are extended to the SACAC Honorary Treasurer on completing his PhD and his thesis "Grinding mill circuit control from a plant-wide control perspective".



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One needs to get involved in the organisation of a large event such as the IFAC World Congress SACAC hosted in 2014, to appreciate the importance of SACAC's link with the International Federation of Automatic Control (IFAC). An international network associated with IFAC participates at an organisational, as well as a technical level, and ensures that all IFAC and IFAC co-sponsored events adhere to IFAC's high standards in all respects. Proceeding of all IFAC events are published on IFAC-PapersOnline, which is available free of charge. This maximises the exposure a participant receives, following such an event. The diverse control community represented by IFAC provides scope for an exciting line-up of plenary speakers – all of which contribute towards a memorable and top-quality event. SACAC is continually perusing opportunities to bring quality IFAC events to South Africa. Hosting these events locally not only makes it much more accessible to all South Africans, but also raises South Africa's profile in the international control community.

SACAC's focus for 2017 is the Control Conference Africa (CCA) 7-8 December in Johannesburg – co-sponsored by IFAC. Come and experience the IFAC-difference, and take part in the workshops preceding the conference to get your CPD points up to date before the December break. More details on this event is provided in this newsletter, as well feedback from members supported by SACAC to attend the IFAC World congress in Toulouse, France recently. The best way to remain up to date with SACAC activities and sponsorships is to join SACAC's LinkedIn group, and by requesting our secretariat to be added to the SACAC mailing list. Feel free to browse our website (www.sacac.org.za) for workshops that are offered on a "per request" basis, and look out for the latest news on local workshops and evening talks.

The strength of the South African Automation and Control community lies in its diversity and the manner in which organisations and their members interact in this space. Let's find ways, as organisations, to collaborate and complement each other, to achieve the mutual goal of serving our members practising as Automation and Control engineers.

Past SACAC events

SACAC AGM

The South African Council for Automation and Control (SACAC) held its AGM on 17 February at the amazing Forum Homini venue in Muldersdrift for the second year in a row. We are pleased to announce the office bearers and EXCO.

Institution EXCO members:

Dr Lidia Auret (US)
Dr Kenny Uren (NWU)
Ms Robyn Verrinder (UCT)
Dr Deon Sabatta (UJ)

Business EXCO members:

Mr Michael Halhead (Anglo Platinum) (subsequently resigned)
Mr Charles Blackbeard (ABB)
Mr Rodney Grobler (Beckhoff)
Mr John Burchell (Lonmin)

Please visit www.sacac.org.za to view our current activities, as there are many including three free evening talks.

Members are encouraged to contact SACAC with requests for brief talks, seminars or workshops on topics or relevance to the industry. You will note a few workshops are available on request on our activities page.

The new EXCO will have a busy year ahead with hosting our first Control Conference Africa (CCA2017) in December 2017, as well as planning for an international IFAC MMM conference in 2019. We look forward to creating continued benefits to each and every member in the year to come.



SACAC Guest Lecture at Stellenbosch University, Alfred Schröder (Aurecon)

Vice-president of SACAC Alfred Schröder presented a guest lecture at Stellenbosch University on 3 March 2017. The topic was advanced control in the water and wastewater treatment industries, and was well received by the audience of undergraduate and postgraduate students. Interesting control challenges and solutions were discussed, as well as examples of advanced control implementations at local Western Cape wastewater treatment facilities. Such guest lectures are a valuable opportunity to expose undergraduate and postgraduate students to real-world control applications.

Alfred Schröder also had the opportunity to congratulate Riccardo Swanepoel, the recipient of the SACAC Control Systems prize for best process control student at Stellenbosch University in 2016.

MIDICON 2017: A doctoral course on modern data analytics and entrepreneurship funded by the EU, John Burchell

The European Institute of Technology (EIT) is an independent body of the EU set up in 2008 to spur innovation and entrepreneurship across Europe. EIT RawMaterials is funding an annual course titled: 'Modern data analytics by case studies on mineral driven control of the production chain from mine to products' (MIDICON). This doctoral course is led by Professor Sirkka-Liisä Jämsä-Jounela from Aalto University Finland, and provides an introduction to modern data analytics with a focus on assessing the value proposition of its application in the raw materials sector.

Aalto University and the University Pretoria (UP) Control Systems (CS) group are collaborating to develop methodologies for the optimisation of mining processes using advanced process control and smart mining concepts. John Burchell, serving SACAC EXCO member and doctoral student in the UP CS group, is attending MIDICON 2017.

The course kicked off with a three day workshop in Falmouth Cornwall Southwest England from the 4th to the 6th of April 2017. This workshop saw lectures on industrial raw materials extraction, their movement up the value chain, together with an introduction to various modern data analytic tools. A number of sites were visited including tin and copper mining operations from the 16th century, kaolin mining sites from the early 19th century, as well as modern kaolin production facilities that are currently in operation.



Students are currently attending online lectures on entrepreneurship and completing assignments on the data analysis of an industrial waste to energy plant. MIDICON 2017 will conclude with a summer workshop in Espoo Finland from the 28th to the 31st of August.

Students, lecturers, and organisers at the MIDICON 2017 kick-off workshop in Falmouth Cornwall Southwest England

Future SACAC events

CCA 2017 LOC Chair report, Otis Nyandoro (Wits University)



The Control Conference for Africa 2017 is the first in a planned series of control conferences organised primarily for the African continent. The Asian- and American Control Conferences have been running for decades, while the European region is served by the European Control Conference. Attempts to run control conferences for the African region have been sporadic and at times in conjunction with the IEEE. CCA 2017 aims to address this by running a more frequent series of control conferences for the

African region.

CCA encourages participation of African authors and co-researchers, as well as those with interests in, or of African origin. Part of the objectives of CCA 2017 is also to actively encourage African countries to become National Member Organisations of IFAC, by making authors from Africa aware of the membership options they can take advantage of. IFAC currently has three African countries as NMO members out of its total of about sixty members. An ideal target would be to have a minimum of six African members so as to constitute 10% membership in IFAC.

CCA 2017 received 76 submissions with at least ten African countries represented. Financial support has been obtained from IEEE through its IEEE Control Systems Society Outreach Fund. This funding supports the travel costs and accommodation for authors from outside of South Africa to attend the conference. Fifteen authors will receive sponsorship as part of this special IEEE Award.

To date the International Program Committee has been processing the paper submissions and acceptances and registration will commence from first week of August through to 11 September 2017. The conference will be starting with a two day set of tutorials running 5th to 6th December, with conference registration commencing in the afternoon of the 6th of December 2017. The conference sessions start on the 7th of December with the conference ending on the 8th of December after a number of plenary speakers, full paper presentations, poster presentations, a number of lively discussions on IFAC membership and benefits, and numerous social excursions.

IFAC News

20th IFAC World Congress, Dr. Kevin Brooks (BluESP)

Thanks to a SACAC sponsorship, as well as funds from my company BluESP, I was lucky enough to attend the IFAC World Congress held in Toulouse. This exceptional event was held in the Pierre Baudis Congress centre, with plenaries and other large gathering happening at the adjacent Palais des Sports. The event has nearly 3,500 delegates, a new record for a World Congress. The majority of participants were understandably from France, with the Chinese delegation being a close second.



Seventeen South Africans attended. Due to these large numbers, papers were presented in twenty-eight parallel sessions. Two innovations were introduced for the conference; the first was interactive sessions, where monitors were used instead of the more familiar posters, and the second was the introduction of open invited sessions, similar to the usual invited session but with the possibility for anyone to contribute. Both these innovations worked well. In particular, the use of a large monitor connected to a computer allows for completely new ways to present one's work.

One example of the open invited session was organised by Ian Craig and Derik le Roux on Advanced Control of Comminution Processes. Two papers in the session were based on work performed at UP, while the other two were from Curtin University in Australia and Universit'e Laval in Quebec Canada. The nett result was an extremely informative session. Our paper was presented in a session entitled Minerals Processing, consisting of six papers in all. I was honoured to co-chair this session. My colleague, Ryan Koorts, presented a paper on flotation at this session, and two of the other papers were on flotation work at the University of Santa Maria in Chile. Other papers concerned sintering and control of reverse osmosis plants. I was pleased to see that this session had more of an emphasis on application than many others I attended.

In addition to these activities, I was lucky enough to attend the IFAC General Assembly on behalf of SACAC. Of particular importance to me was the adoption of some constitutional amendments allowing for the formation of an Industry Committee as part of the Technical Board. I had served on a pilot committee for this, and hope to continue to make a contribution to this fully-fledged committee. In this regard, I also was a presenter at a panel of five industrialists and academics, where the topic was "How to Enhance Industry/University Collaboration on Advanced Control". I attended a meeting of TC 6.2 (MMM) and gave feedback on our application for MMM 2019 to be held in Stellenbosch. The chairman and meeting gave its support, and requested that we request their involvement in our IPC as soon as possible.

As ever one of the real benefits of attending conferences is the people you meet. Apart from some South Africans, and people working the MMM field, I was lucky enough to meet a number of people who will be attending the Control Conference Africa at the end of the year. Having met them is of great advantage when it comes to making arrangements.

TOULOUSE, FRANCE | 9-14 JULY 2017



IFAC Past President's Report, Ian Craig

The International Federation of Automatic Control (IFAC) is a body consisting of 49 country members called National Member Organizations (NMOs) (<https://www.ifac-control.org>). SACAC has represented South Africa in IFAC for 56 years, i.e. since 1961 (<http://sacac.org.za>).

The main IFAC event is the World Congress which is held every 3 years. The 2014 Congress was held in Cape Town (<http://ifac2014.org>) and the 2017 Congress in Toulouse, France (<http://www.ifac2017.org>). The 2020 Congress will be held in Berlin,



Germany (<http://www.ifac2020.org>), and the 2023 Congress in Yokohama, Japan. The IFAC General Assembly, consisting of NMO representatives, meet face-to-face every three years at the World Congress. In addition, many other IFAC meetings are held including those of the incoming and outgoing Council, Executive Board, Technical Board and their respective committees.

IFAC2017 was held from 9-14 July 2017 and was a great success. There were 3,462 delegates who could choose from about 2,919 presentations (soon to be posted on ScienceDirect; <http://www.sciencedirect.com/science/journal/24058963?sdc=1>), 11 plenary addresses (see <http://www.ifac2017.org>) and soon to be posted on YouTube;

<https://www.youtube.com/channel/UCLcWoqbVNxo9rVSS9NKQDeA>), panel sessions, technical visits and also a social programme. What made the 20th IFAC World Congress special was that we celebrated the 60th anniversary of IFAC, the highlight of which was the unveiling of an e-book called “The IFAC Story” that is available online (see <https://www.ifac-control.org/news>).

For me personally this was a milestone Congress seeing that I attended my last IFAC Council meeting as a Council member -I was on the Council since the 2002 Congress in Barcelona- and I was awarded the title of IFAC Advisor at the Congress opening ceremony. I will however continue to serve IFAC in the capacity as Chair of the IFAC Publications Committee and Chair of the IFAC Foundation Board of Trustees.

For more information: <http://www.ifac2017.org> or follow IFAC on Twitter ([@IFAC_Control](https://twitter.com/IFAC_Control)) and Facebook (<https://www.facebook.com/IFACcontrol/>)

Sponsorships

Arnold Pretorius (PhD student, UCT)

My submitted paper focused on designing a low-cost motion capture system for use in localising small-scale robots. Although state estimation is not my field of expertise (or the primary scope of my PhD) I had great interest in gaining more knowledge in it. My main interest however is in applying control design to robotic platforms, which fell under the conference sessions of “mechatronics, robotics, and components”. In this stream there was no shortage of amazing work - from autonomous drones performing coordinated manoeuvres to snake-like robots surveying radiation levels near Fukushima power plant.

My paper was allocated to the dreaded poster session, newly renamed to “interactive session”. I was quite disappointed, and embarrassed even, when hearing about this, but my opinion changed when I saw how it was done at the IFAC 2017 World Congress. Instead of showing static, lifeless posters, presenters were displaying lively, animated digital posters, with videos and interactive links to other visually stimulating information. There was also a palpable buzz of verbal presenter-presentee interactions. The 2 hour time slot, as opposed to the traditional 20 minute oral slot, also allowed for in-depth conversations with interested parties.

Every morning a different presenter would give a 1 hour plenary on their work. This was definitely one of the highlights of the conference. Each presenter spoke with such passion and enthusiasm, and their work was quite impressive. For example, one presentation focused on applying control theory to water systems in order to reduce the amount of water wastage – something which is very relevant in Cape Town at the moment.

From my point of view the conference was a complete success. The average level of intellect at the conference was truly humbling, but everyone was friendly, welcoming, and excited to share their knowledge without hesitation. I gained an immense amount from this conference, which is not only limited to engineering knowledge, but also the life experiences that go with travelling alone to an international conference.

Ryan Koorts (BluESP)

Firstly, a big thank you to SACAC and BluESP for sponsorship toward the 2017 IFAC congress in Toulouse, France. I felt both privileged and honoured to be able to represent South Africa at such an internationally renowned event. The venue itself, Pierre Baudis Congress centre, was top notch and all efforts were made by the IFAC team to accommodate the roughly 3,500 delegates from all corners of the globe. With a process control background centred mainly around minerals and mining, I naturally presented recent work on Glencore's Mt. Isa mine in Queensland, Australia. The setting for the presentation, a make shift office container, took some getting used to as the conference was pushed to accommodate the mentioned large number of delegates. However, this did not stop a healthy audience turnout to attend our session on 'Minerals Processing' where I spoke about myself and my colleague, Kevin Brooks' work on Model Predictive Control of a Zinc Flotation bank using online X-Ray fluorescence analysers. Some presenters in these makeshift rooms were even able to brag, "they had people queuing out the door". The other papers in the session were around wider plant control of flotation units, sintering and control of reverse osmosis plants.

There were some incredibly interesting talks by passionate people in their respective fields. I feel the most memorable talk I attended was the plenary on Snake Robots by Kristin Pettersen from the Norwegian Univ. of Science and Tech. This presentation explored the possibilities of robots that mimic the movements of snakes for applications from firefighting and rescue through to deep sea oil rig maintenance.

As a whole, the congress cemented in me the idea that robust practical applications are still lacking as a whole in the university control field and that further work and collaboration between university research and industry needs addressing. The open panel sessions which dealt with this exact issue were a great platform for discussion and I'm hopeful this will lead to improvements in this area. The social events were a great opportunity to meet like-minded students and industry leaders. Again, a memorable and fantastic event that I will be forever grateful in attending.

Lihle Nkomo (PhD student, Wits)

My contribution to the 20th IFAC world congress, was a demonstrative paper in the 5th automatic control demonstrators session. The contribution was titled Comparison of a back-stepping and sliding mode control techniques for a high performance active suspension system. It presented the design and implementation of an active vehicle suspension system that aimed at reducing vibrations experienced by the driver. The demonstration was of a half-car suspension prototype utilising an adaptive sliding back-stepping controller to mitigate the impact of road disturbances. The demonstrator type was of a static exhibition and an interactive presentation. This session allowed for interaction between attendees and the demonstrators on the developed prototypes during four hour slots. The observed trend in most of the automotive control demonstrators focused on the development of self-driving cars.

Most of the workshops and presentations focused on the state-of-the-art technology and modern challenges such as automation of auto-mobiles and clean energy. The presented work showed an integration of mechanical applications with electronics and automatic control. This highlighted advances made by the development of auto-mobile, energy generation from alternative sources with intelligent control designed to drive efficiency. Technical tours offered at the conference such as Airbus and [Cité de l'Espace](#) were very inspiring and engaging.

Attending the congress gave me an opportunity to see the research, testing and development being conducted in different fields of control such as self-driving cars, clean energy, robotics and artificial intelligence. It made me realise that I could implement my developed high performance controller on an actual vehicle suspension system rather than on a developed prototype. It also presented a platform for me to network, collaborate and form strong relationships with fellow researchers from around the world.

Member updates

Congratulations are extended to our Treasurer, the now, Doctor, Derik Le Roux on receiving his PhD and on his recent engagement in Paris. The SACAC EXCO wishes you all the best.

Dr. Derik le Roux received his BEng (2009) and PhD (2016) degrees from the Department of Electrical, Electronic and Computer Engineering at the University of Pretoria. He completed his thesis “Grinding mill circuit control from a plant-wide control perspective” under the supervision of Prof Ian Craig, with additional guidance from Prof Andreas Kugi (TU Wien), Prof Sigurd Skogestad (NTNU), and Prof Radhakant Padhi (IIT Bangalore). He is employed as a lecturer at the University of Pretoria since 2011, where he



teaches basic circuit principles to all engineering undergraduates, and optimal control to postgraduate students.

His research interests include state and parameter estimation, plant-wide control, and model-based control as applied in the mineral process industry. He serves as the Treasurer of SACAC since 2015, and also serves on the organising committees of CCA 2017 and MMM 2019.