



Message from the President – John Burchell



The year is fast drawing to an end. For many of us there remains a final push to finish off commitments before taking a break. I wish all of you the best towards closing out this year and a safe, rewarding time with your families over the festive season.

The SACAC will close out the year with the highlight of our 2021 calendar: Control Conference Africa (CCA). This conference will take place on the 6th and 7th of December in Muldersdrift Johannesburg, and aims to promote the exchange of ideas and developments in control engineering in Africa. CCA is co-sponsored by the International Federation of Automatic Control (IFAC), of which SACAC is the national member organisation in South Africa. Virtual attendance will be an option to accommodate any uncertainties surrounding recent COVID developments. More details on CCA later in this newsletter.

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Reminder: CCA 2021, Muldersdrift, SA | 7-8 December 2021

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Besides CCA, the SACAC delivered a number of our familiar seminars and workshops. We also made progress towards strengthening relationships with related organisations. A collaboration with the South African Institute for Mining and Metallurgy (SAIMM) and the Robotics Association of South Africa (RASA) delivered a talk on “Robotics in Mining” to our joint members. We also connected with the Johannesburg Chamber of Commerce and Industry (JCCI) and COVA-advisory to deliver a forum webinar on Government Grants and Incentives.

Some thoughts on how we can align ourselves to current industry trends. Increasingly, Environmental, Social, and Corporate Governance (ESG) are factors considered in measuring the sustainability of our organisations. ESG can be simplified as corporate purpose and sustainability, as Eccles et al. note in their piece¹, on the HLS Forum on Corporate Governance, “the purpose of a company is to produce profitable solutions to problems faced by people and the planet”, while at the same time “not profiting from producing problems for people and planet”, which represents a failure in sustainability.

With increased pressure to adopt an ESG focused culture, which attracts socially responsible investment, a winning strategy would be to encourage and incentivise sustainability projects. As automation and control engineers, it falls on us to identify opportunities for optimisation that benefits ESG. Perhaps as an organisation we can establish platforms to support this.

I would like to acknowledge the dedication of our SACAC leadership team and those organisations we collaborated with. It was a productive year for our council on the back of their efforts.

Best Regards,

John Burchell

¹ Robert Eccles, Colin Mayer, and Judith Stroehle, 2021, The Difference Between Purpose and Sustainability (aka ESG), viewed 28 November 2021, <https://corpgov.law.harvard.edu/2021/08/20/the-difference-between-purpose-and-sustainability-aka-esg/>

Past SACAC events

Control Systems Day

The SACAC Control Systems Day was held on the 18th of November, and for the first time it was held as a hybrid event where students and academics could present their interesting research. The 20 physical attendees, hosted at the University of the Witwatersrand, were joined by the online attendees and it proved to be a very interesting event.

Academics from Wits, University of Pretoria (Chemical and Electrical Engineering), University of Zululand, and Stellenbosch University presented an overview of their current research activities, while students from various universities were able to present their research work to an audience that included academics and members from industry.

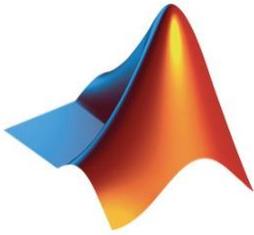


It was very good to have an event where SACAC members could all come together, and the fascinating research on display bodes well for the future of control and automation in South Africa. We are looking forward to the event in 2022!

Observer Design workshop

The Observer Design workshop, as presented by Derik le Roux on 22 October 2021 in Pretoria, focussed on the intricacies and nuances of designing observers. The workshop was presented in hybrid format with 8 in-person participants and 12 online participants. The online participants joined from Johannesburg, Hartbeespoort Dam, Gqeberha, and even Zambia. The workshop included various exercises in Matlab for participants to experiment hands-on with observers. A word of thanks is extended to Opti-Num Solutions for providing participants access to Matlab.

The workshop introduced the fundamental theory of observability, how observability relates to state estimation, considered how the filters such as Kalman filters can be used for estimation, and how to ensure a design of a filter succeeds.



The workshop provided participants with an extensive set of notes, additional reading material and the full set of Matlab examples.

Please feel free to contact SACAC if you would like a repeat of this workshop.

Robotics in Mining

The SACAC arranged a webinar on “Robotics in Mining” on the 28th of October. The event was co-hosted with the South African Institute of Mining and Metallurgy (SAIMM), the IEEE joint chapter for Control Systems / Robotics and Automation (IEEE CS/RA), and the Robotics Association of South Africa (RASA).

It was presented by Dr Shaniel Davrajh, a leading expert on the topic and a Principle Mechanical Engineer at the Center for Scientific and Industrial Research (CSIR). The talk covered robotics, mechanisation and robotisation, applications in mining, emerging developments, and the impacts of robotics in mining. It was well attended with over a hundred registered attendees.

Future SACAC events

Control Conference Africa (CCA2021)

“The Control Conference Africa 2021 will be held on the 6th and 7th December. This hybrid event will be held at Misty Hills in Muldersdrift and all around the world. The six plenary sessions will be presented from Hong Kong, Arizona, Johannesburg, Melbourne, Trondheim and Lee-on-Solent. Thirty-eight papers have been accepted after a thorough review process, with authors from Nigeria, Mauritius, South Africa, Eswatini, Tunisia, China, Italy, Russia, United Kingdom, Iran, Japan, Canada, Denmark, Brazil, France and India. Truly an international gathering supporting our African control theme.



Unfortunately, the COVID situation has reduced the number of delegates who can attend in person, but this was an eventuality the organisers had planned for. The virtual attendees will be at the venue in spirit and will have the opportunity to be involved in

all the sessions, and to answer questions on their paper during the sessions in which it is presented. For those attending in person, there will be a relaxed welcome reception, a sumptuous gala dinner and a brief closing ceremony. We would like to thank Anglo Platinum, Opti-num Solutions, The IFAC activity fund and the IFAC Foundation for their support of the event.



The conference will be preceded by a workshop showcasing industrial applications of machine learning in process monitoring and control, as well as providing hands-on experience in the application of basic ML techniques. Participants will be guided through examples illustrating fundamental concepts of ML, including the bias-variance trade-off, linear regression, classification, resampling techniques, regularization and feature extraction. Due to the kind sponsorship of Stellenbosch University, virtual registration for the workshop is free, and also very reasonable if you would like to attend in person.”

For more information, please go to [CCA2021](http://cca2021) or contact [SACAC Secretariat](mailto:info@cca2021.org).

Machine Learning for Process Control

As part of the upcoming Control Conference Africa, the South African Council for Automation and Control is pleased to be hosting a workshop showcasing industrial applications of machine learning in process monitoring and control as well as providing hands-on experience in the application of basic ML techniques. Participants will be guided through examples illustrating fundamental concepts of ML, including the bias-variance trade-off, linear regression, classification, resampling techniques, regularization and feature extraction.

The examples are designed to clearly illustrate ideas that are relevant to all ML applications, providing exposure and resources to enable participants to engage with the field more effectively. The workshop will culminate in participants applying what they have learnt to develop a soft sensor for a well-studied penicillin fermentation reactor. The workshop is aimed at newcomers to the field of ML, but some basic programming knowledge is required.

Please visit www.cca2021.org or email info@cca2021.org for more info.

Sponsorships

MMM2021 Sponsorship

The conference landscape has changed significantly the past two years, with most conferences now moving either online or to a hybrid format. Amid these changes, we are pleased to say we were able to sponsor at least three of our members to attend the international MMM 2021 online conference. You can read more of their experiences below.

Lukasz Ziolkowski:



My experience attending the 6th IFAC workshop on Mining, Mineral and Metal Processing conference was overall a positive experience which I very much enjoyed. The conference organizers and hosts did an excellent job at ensuring the presentations ran smoothly and encouraging engagement during the presentations. I got the opportunity to attend and present at the conference with the generous support from SACAC, which I am grateful for. My presentation was about employing a model-free optimization method to improve grinding mill performance.

Although the conference was hosted virtually and we could not physically meet, I was happy to see quite a few familiar names in the virtual presentation rooms. I thought it was quite convenient to attend the conference by listening to the presentations from the comfort of my room. It was also exciting to see researchers from different parts of the world come together, share their work and engage with one another. I always appreciate the passion and enthusiasm that everyone has when it comes to learning and sharing their knowledge.

During the presentations, I was exposed to several areas unknown to me where process modelling and control is applied to optimize and efficiently control processes. This has further broadened my perspective on how vast the control field is in terms of applying control techniques. I personally enjoyed learning about how feedback control is applied to improve freeform bending processes by reducing the effects of springback. There were also two excellent plenaries presented by Prof. Jörg Benndorf and Prof. Lidia Auret, which I enjoyed listening to and found interesting as they were both relevant to mineral processing. Something that really opened up my mind was the topic of fault detection within processing plants and the ways in which it is addressed to minimize downtime. From a theoretical perspective, we tend to typically assume that processes will operate smoothly and primarily focus on improving performance. Although it is an entire topic on its own, it is something to keep in mind.

Once again, a big thank you to SACAC for their sponsorship and as well as to the conference organizers for hosting a platform to share and present ideas.



Theresia Mohlalakoma Ngwako:

On the 2 September 2021 I had the honour to share two of my research contributions at the IFACMMM 2021 conference. One of my research contributions was on optimizing the performance of mining trolleys by using optimal control techniques where the key focus was on minimizing losses in the trolley system. The second research contribution using linearization techniques to linearize a highly nonlinear mining trolley system thereafter, linear control techniques are used to control the speed of trolley system and the intentional to is achieve optimal performance.

What I appreciated from the conference was the organizers’ ability to change the conference from being a traditional conference to being a hybrid conference and eventually, a full online conference. This allowed for an inclusive environment especially for countries where the borders were closed due to Covid-19. This also meant that some of us were able to participate by giving presentations and learning about the state-of-the-art technology in the mining sector.

I had two research presentations, presented in the same session which I was excited to share with other researchers on an international platform. At the same time, I was unsettled because while the online platforms have many advantages there are also uncertainties such as the network disconnecting during a presentation – I am thankful I did not experience that during my presentation!

A learning moment for me was when I came to realization that more females are still needed in the control and automation field. Just like any other STEM field, the assumption is that participants in the conference are male. I left the conference encouraged to be leader in the field and I left motivated to encourage other females to go into research and STEM fields.

I was thoroughly enjoyed and learnt a lot from the session on model-predictive-control which is topic I would like to branch into in the future. I also learnt a lot from some of the presentations on mining haulage systems.

I would like to end by thanking SACAC for the generous sponsorship which allowed for me to register my papers to be presented at the conference. Without the sponsorship participating at the conference would have been a challenge.



Kamohelo Sekila:

For me the conference was interesting and at times intimidation. The idea of presenting a research project to a world class experts made me nervous and fulfilled at the same time. I felt the growth though.

With regards to some elements of the conference that I enjoyed the most, three presentations were quite interesting for me.

One involved the use of new technologies to improve the operations on mineral processing plants. This was the use of neural networks on estimating the particle size distribution of the

hydrocyclone underflow. Although the application of neural networks on particle size distribution has been there for quite sometime now, it was interesting to see that there are some advancements that are made to improve mineral processing in this regard.

Furthermore, one other researcher talked about online condition monitoring of a hydraulic rock drill used typically in underground mining. He mentioned that it is difficult to put extra sensors around the rock drill equipment but proposed a method that can still help in monitoring the condition of the equipment even at minimal instruments. Though some of his content was tricky to grasp, I found the research quite interesting.

The last presentation involved the field of Fault Detection and Identification. In this case, a research using data science methods for anomaly detection for a hot steel plant was presented. This was interesting.

Also, how most researches were centred on application of Mathematics to mineral processing industry was quite amazing. Lastly, I was paying attention to how other people were painting their ideas. I learned a lot only from this. This information is useful for me in the future.

MMM2022 Montreal

The next MMM conference will be held in Montreal (Canada) from 15 to 18 August 2022. We are offering sponsorship to authors planning to attend the conference. If you are interested, please be sure to submit your paper to MMM2022 before 15 December and to visit our website for more information.

IFAC News

2020-2023 IFAC Fellows and Major Awards: Calls Now Available

Calls are now published on the IFAC website and in this issue of the IFAC Newsletter for the 2020-2023 IFAC Fellows and Major Awards (Nichols, Thoma, and Quazza Medals, and the High Impact Paper and Industrial Achievement.) Please note that the IFAC Fellows and Major Awards are awarded on a triennial (NOT yearly) basis.

IFAC is seeking nominations for 2020-2023 IFAC Fellows. The IFAC Fellow award provides a distinction of excellence in the Federation and is conferred on a small number of outstanding scientists or engineers by the IFAC Council, based on the proposal of the Fellow Selection Committee. With the appointment as an IFAC Fellow, IFAC honors outstanding contributions with a high impact in the fields of interest of IFAC in the role as a Scientist, Engineer, Technical Leader or Educator.

Calls for 2020-2023 IFAC Major Award Nominations

Call for Nominations for the IFAC Major Awards: Giorgio Quazza Medal, Nathaniel B. Nichols Medal, Manfred Thoma Medal, Industrial Achievement Award, and High Impact Paper Award According to the provisions as outlined for the IFAC Major Awards, the IFAC NMOs and the IFAC Technical Committee Chairs as well as other individuals are invited to nominate a candidate (candidates) for one or more of these awards. The nomination should be uploaded electronically at <https://ifac.papercept.net/conferences/scripts/submissionwizard.pl?ConfID=467> no later than February 15, 2022

Source: IFAC October 2021 newsletter

11th IFAC Symposium on Advanced Control of Chemical Processes ADCHEM 2021 13-16 June 2021

Venice, IT

The 11th IFAC Symposium on Advanced Control of Chemical Processes (ADCHEM 2021) was originally scheduled to be held in Venice. However, due to COVID-19 pandemic, it was held as a virtual conference. As one of the triennial meetings of the International Federation of Automatic Control, ADCHEM 2021 brought together 159 researchers and practitioners to discuss recent developments in the control of chemical, biochemical, and related process systems. Based on a rigorous review process, the International Program Committee (IPC) selected 119 papers for presentation. Taking advantage of inherent benefits of the virtual platform, all the sessions were oral sessions; the program consisted of 17 regular sessions, 12 keynote lectures (all selected from the contributions), three plenary sessions. In order to allow the interaction among the participants, the plenary and keynote sessions were broadcast live and their recorded videos were made available since the day of the talk. Archived pre-recorded presentations were also provided on-demand for the other technical sessions from the first day of the symposium

Source: IFAC October 2021 newsletter



Future IFAC Events

There are many upcoming IFAC events, the full calendar is available at: [IFAC Events Page](#)