YOUNGER MEMBERS' GROUP

Next Gen Nav 2023

Peter Thompson, a Committee Member of the RIN Younger Members' Group (YMG) and a PhD Student at University College London (UCL), provides an overview of the recent YMG Next Gen Nav event.

Peter Thompson, PhD Student, UCL

On 24 October 2023, the RIN Younger Members' Group held the third Next Gen Nav mini-conference. Next Gen Nav is a free event designed to help participants develop presentation skills, gain insights, build their network, and share ideas and challenges with a friendly audience..

This event served as a platform for early career researchers and innovators in positioning, navigation, timing (PNT) and related systems and applications to exchange their ideas and expand their professional networks. The conference was created to provide opportunities for presenters and attendees to:

- share their innovations and research in a constructive and friendly environment among peers in related fields;
- develop their presentation skills, providing valuable preparation for larger conferences in a more informal setting;
- gain insights from peers and keynote speakers in related domains;
- expand their professional connections and networks;
- promote the exchange of navigation challenges and solutions between academic institutions and industry.

The conference took place in person at the Digital Aviation Research and Technology Centre (DARTeC) at Cranfield University, a leading institution in the UK's research into digital aviation technology. The event included addresses from John Pottle *(Royal Institute of Navigation)*, Chrissie Hillyer *(Spirent)*, Michelle Brown *(YMG Co-Chair)* and myself.

Chrissi delivered a comprehensive overview of the diverse range of products and sectors that Spirent is actively engaged in. Subsequently, she generously shared her career journey, offering valuable insights and advice for emerging researchers in the field of PNT.

Michelle told the audience about what the RIN's YMG offers those who are early in their careers. I shared an overview of the Professor David Last Tribute Fund and recounted my experiences at the European Navigation Conference (ENC) 2023.

The Next Gen Nav 2023 event featured a demonstration of the Spirent simulator setup at DARTeC. The demonstration illustrated the process of realistic drone navigation data generation utilising Spirent's GSS7000 GNSS (Global Navigation Satellite System) Simulator with Hardware-in-the-Loop (HIL) capabilities and OKTAL-SE's Sim3D for advanced multipath simulation. By employing another Spirent software

tool, SimSENSOR, it is also possible to emulate realistic IMU (inertial measurement unit) data.

In the simulation framework, we also saw how the GSS7000 can be interfaced with another software environment AirSim to allow the representation of authentic drone dynamics as well as vision information, as it comes from the on-board camera of the drone navigating in a photorealistic 3D environment.

The demonstration of a drone survey within the challenging Urban Canyon environment of Toulouse allowed the audience to recognise the complexities that this setting represents for PNT technologies and appreciate the performance and robustness demands that drones have for a navigation system. The state-of-the-art multisensory navigation algorithm utilised within this demonstration highlighted the benefits of the realistic PNT simulation framework when it comes to system efficacy in complex navigation tasks.

The main event consisted of eight ten-minute presentations, where participants showcased their ideas and explored their potential impact on the next generation of navigation. The conference welcomed a diverse range of projects from both industry and academia and across varying project stages. The presentations were intended to be informal and informative, to stimulate ideas and build knowledge and understanding. As hoped, there was a range of presentation topics, which included:

- duel frequency GNSS receivers
- radiofrequency (RF) interference detection
- multi-sensor fusion
- visual navigation
- integrity monitoring
- artificial intelligence (AI) for position navigation and timing (PNT).

Several presentations included research on the platforms of drones, which had a specific focus on urban air operations as well as low earth orbit (LEO) satellites.

The presentations were judged by an expert panel, with the best presentation on the day earning the Prof David Last Tribute Fund award, granting the recipient the opportunity to attend a major navigation conference in 2024.

The judges scored the presentations based on three criteria, whilst taking into consideration the type of project and development stage of each project on an individual basis:

- Technical excellence & Innovation: The awareness, method, approach, rigour, application, testing, and conclusions of the work, as well as the extent to which science, technology or practice are advanced
- Societal Impact: Significance in terms of the extent of benefit for research and/or wider good
- Presentation: Clear writing and presentation, appropriate use of figures, and succinctness.

The award for best presentation at Next Gen Nav 2023 was co-awarded to Alex Schofield from the University of Warwick and Fraser McGhan from the University of Cardiff. Alex Schofield is undertaking a PhD at the University of Warwick and delivered a presentation on 'Navigating GNSS in Smartphones' from research during an MEng at the University of Nottingham. While Fraser McGhan, a PhD researcher from the University of Cardiff, delivered a presentation on 'A Learning-Based Approach to Indoor Robot Navigation'. Both outstanding individuals will receive support from the Professor David Last Tribute Fund to attend a major navigation conference in 2024, where they will have the opportunity to further showcase their work and expertise. Congratulations to Alex and Fraser on their well-deserved recognition!

Alex Schofield said:

"Attending the Next Gen Nav event was truly an enriching experience. As a new PhD student specialising in Assured PNT, it offered valuable insights into the current research being carried out in the field. The opportunity to connect with peers currently undertaking their PhDs and the chance to present at a conference while receiving constructive feedback were invaluable. It's a huge honour to receive the Prof David Last Tribute Fund award for my presentation. This opportunity fuels my momentum and ambition to produce some results worthy of sharing with the wider community at the European Navigation Conference in May"

Fraser McGhan said:

"I really enjoyed the Next Gen Nav conference! It was a great opportunity to meet other young researchers from different academic backgrounds. I'm looking forward to attending the European Navigation Conference next year, courtesy of the Prof David Last Tribute Fund award."

Future Next Gen Nav conferences will aim to expand its audience and presenter base whilst focusing on developing connections and networks across academia and industry. They will also go further to promote research collaborations and professional opportunities. Watch this space!