robotics Swiss National Centre of Competence in Research

COMMUNITY NEWSLETTER

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Public Version

LATEST NCCR NEWS

Swiss Robotics Days

The Swiss Robotics Day will take place on the 4th of November in Lausanne. The event is Switzerland's most comprehensive exhibition on robotics for service sectors. It brings together industry, researchers, innovators, creators, investors, engineers and students to exchange and share experiences, new ideas, technologies and together, envision solutions to future needs. See the agenda and register now!

From NCCR Robotics to the Robotics Innovation Booster

The Lausanne event will mark the conclusion of NCCR Robotics. After 12 years, the project will officially end on 30 November 2022. A final issue of this newsletter will be distributed in November. Some of the NCCR activities, in particular those on technology transfer, will continue with the Innovation Booster Robotics. Please subscribe to their newsletter (scroll down the homepage for the registration link) and remain informed about important activities on robotics in Switzerland.

FIRST Global Challenge

From 13 to 16 October, Geneva hosts the FIRST Global Challenge, of which NCCR Robotics is an organisational partner. It is an olympics-style, international robotics competition that takes place in a different country each year. FIRST Global invites each nation to send a team to build and program a robot to compete. Teams work together to complete tasks in a game themed around one of the greatest challenges facing our planet, including the 14 Grand Challenges for Engineering, in an effort to foster understanding and cooperation among the youth of the world as they use their abilities to solve the world's problems. Read more.

Pulp Team

Researchers from the Gambardella Lab at IDSIA led the PULP team, which won the 1st Nanocopter AI challenge thanks to a collaboration with Università di Bologna and TII Abu Dhabi. The competition was held in Delft on 13 September, and the teams were tasked with developing a palm-sized quadrotor's intelligence to enable autonomous navigation in an unknown environment cluttered with fixed and moving obstacles. The PULP team was ranked first, beating teams from Brazil, Spain, and the Netherlands, thanks to onboard artificial intelligence capable of long collision-free flights. They scored a remarkable 110 meters autonomous flight in 5 minutes, avoiding all moving obstacles. Read more.

Nature cover

Mirko Kovac's group had an article in *Nature* where they introduced highly manoeuvrable aerial robots that can perform additive 3D construction tasks. Inspired by natural builders such as wasps and bees, the researchers created BuildDrones (as shown on the cover) that can work in an autonomous team to perform 3D printing tasks using foam- or cement-based materials. The work was featured on the cover of the journal. Read more.

AI for good

A webinar on "Unleashing autonomous drones for disaster risk reduction" will take place on Thursday 13 October, 16:00-17:30 CEST, Geneva, as part of "AI for Good", the United Nations platform on Artificial Intelligence. It is organized by the International Telecommunication Union in partnership with 40 UN sister agencies and co-convened with Switzerland. Dario Floreano will be among the panelists, together with Vijay Kumar, Yan Wan and María Inés Díaz. Read more.

EECV paper

In this issue...

ROBOTICS WORLD

Top News

· This Cheetah Robot Taught Itself How to Sprint in a Weird Way
· For better or for worse. Tesla Bot is exactly what we expected

External calls

· 2023 IEEE World Haptics Conference
· Open Invited Track on "Mechatronics Tools and Control Related to Robotic Manipulation"

Start-up corner

Please find the following links related to start-up support. If you would like to promote your events through our channel, please contact us. We remind you that our spin-fund call is now closed.
nccr-robotics@epfl.ch

· Innosuisse training on business growth in advanced engineering. Modules in Lausanne and Zurich from October 2022 to all 2023.

Equal Opportunities Corner

· **Women in tech leadership resources**
RoboHub has a new article with several suggestions for useful information and educational resources for women in leading positions in technology.
· Lack of diversity in field robotics
An article in Australia's Cosmos Magazine argues that field robotics could benefit from more gender diversity and more diverse datasets.

External positions

· Open independent group leader position at MPI for Intelligent Systems, Stuttgart
· Job Openings in Robotic Systems and Operations at NASA Jet Propulsion Laboratory

Scaramuzza's lab has a new paper at the upcoming European Conference on Computer Vision (ECCV), which overcomes the lack of semantic segmentation datasets for event cameras by directly transferring the semantic segmentation task from existing labeled image datasets to unlabeled events. The approach neither requires video data nor per-pixel alignment between images and events. For more details, check out the paper, video, code, and dataset.

They, robots

NCCR Robotics has partnered with photographer Matthieu Gafsou for this exhibit that celebrates robots, and Swiss research and innovation in the field. The exhibition has been hosted by the Rolex Center on the EPFL campus in Lausanne from 3 August to 2 October, and was closed by a finissage on Friday 30 September at 6.15 pm, following the Campus Lecture by the artist and physicist Merritt Moore. It will next be exposed in Geneva as of the 13th of October. Read more.

Article on the Myoshirt

The Riener group's soft wearable exoskeletons for the upper limbs was described in an article in Nature Machine Intelligence in late June. The article suggests that the Myoshirt is an effective tool that intuitively assists the shoulder during functional reaching tasks, with the potential of increasing the personal independence of people with upper limb impairments.
Read more.

NCCR Automation Symposium

NCCR Automation organises a two-part symposium on 24 and 25 October at EPFL, on "The interplay of dynamical systems, neural networks and control" and "Socially responsible automation". Each part of the workshop will be followed by a reception concluding the day, and individual meetings with researchers on the following day. Davide Scaramuzza will be a panelist on the first day. Read more.

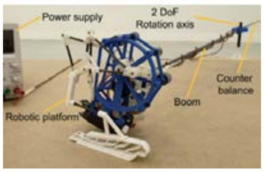
"Tales from a Robotic World" book

Written by Dario Floreano and Nicola Nosengo, the book "Tales from a Robotic World" tells robotics stories from a not-so-distant future, and describe today's science and technology that will make them possible, including impact on jobs, future business models, and what could go wrong. The book was published by MIT Press on 27 September.

New articles on autonomous flight

Several new articles were posted on ArXiv by the Scaramuzza lab at the University of Zurich. They include the HILTI SLAM Challenge 2022 paper and dataset, collected in collaboration with Oxford University; the E-NeRF (Neural Radiance Fields from a Moving Event Camera) paper, a collaboration with Simon Klenk and Daniel Cremers from TU Munich on how to estimate a neural radiance field from both a single moving event camera or from an event camera in combination with a standard camera; and an article on Time-optimal Online Replanning for Agile Quadrotor Flight where a time-optimal trajectory is generated and tracked in real-time.

Making robots hop



The Floreano and Ijspeert labs collaborated on an article that describes a new elastic actuation system based on an inverted cam that is capable of generating cyclic locomotion with controlled elastic energy charge and release for small-sized robots. It has the potential to be used in other robotic applications, such as flapping wings in the air and tail fin waving in water. Read more.

Article on sensory feedback in prostheses

A joint paper from the Riener and Raspopovic labs in *Journal of Neural Engineering* addresses the problem of lack of a natural sensory feedback in prosthetic devices, which forces users to adopt compensatory walking strategies that increase fatigue. The work presents a non-invasive feedback system based on electro-cutaneous stimulation, that successfully enabled subjects to decrease metabolic consumption while walking and increase prosthesis confidence. Read more.

Articles on fixed-wing drones

The Floreano lab has also two new papers accepted that will be published in the next few weeks: “Sharp turning maneuvers with avian-inspired wing and tail morphing”, with first author Enrico Ajanic, that will appear in *Communications Engineering,* a new journal in the *Nature* family*;* and "Accurate Vision-based Flight with Fixed-Wing Drones" to be presented ad the *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS),* first author Valentin Wüest.

NCCR Robotics

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CONGRATULATIONS

Master thesis award

The NCCR Robotics Equal Opportunities Committee has decided on the selection of 17 awardees for the “MSc Thesis Award to master students in Robotics”. The award ceremony will take place during the Swiss Robotics Day on 4 November in Lausanne. The full list of winners can be found here.

Enrico Ajanic

On 23 September Enrico completed his doctoral programme in Floreano's lab with a thesis on "Wing and tail morphing in birds and drones", examined by Guido de Croon and Graham Taylor.

NCCR ROBOTICS OPEN POSITIONS

Robotics and perception group, UZH

The Scaramuzza lab has multiple openings for Phd students and Postdocs in Reinforcement Learning for Agile Vision-based Navigation and Computer vision with Standard Cameras and Event Cameras. Job descriptions and how to apply.

PhD and postdocs on agile and multimodal drones

The EPFL Laboratory of Intelligent Systems welcomes applications from Master students interested in the design, characterisation, and prototyping of avian-inspired drones capable of agile flight that approximate the agility of birds of prey and can fly over long distances with minimal energy requirements, and for a postdoctoral scientist in aerial robotics with a PhD degree and a strong track record of publications in aeronautical engineering, control, or machine learning with applications to drones. Read more and apply.

PRESS COVERAGE

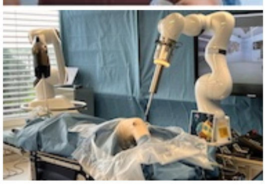
Myoshirt in the news

The publication by the Riener group of the Myoshirt received coverage in *The Independent* and was featured in ETHZ News.

RPG on the main German TV Kids program "1, 2 oder 3" on ZDF

Leonard Bauersfeld and Elia Kaufmann from the Scaramuzza lab were invited to the famous German TV program for kids "1, 2 oder 3" to talk about drones. Watch the full video in the ZDF Mediathek here. The part featuring them starts at 14:45.

Robotic surgery



Georg Rauter's work on minimally-invasive robotic laser surgery was featured in SWR, Baz Online, and SRF.

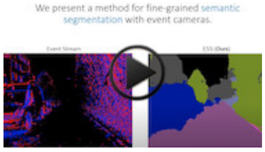
Q&A with Roland Siegwart

An interview with Roland Siegwart appeared in L'Illustré (in French) and in Schweizer Illustrierte (in German). In the interview, Siegwart explains ins work towards creating less "timid" drones, that do not need to avoid obstacles but can fly close to buildings and infrastructures to perform operations.

NEW VIDEOS

Robotic Digitalization in Construction with ANYMal

Learning Event-based Semantic Segmentation from Still Images



SELECTED NCCR ROBOTICS PUBLICATIONS *

L. Chee, G. Valle, M. Marazzi, G. Preatoni, FL Haufe, M. Xiloyannis, R. Riener, S. Raspopovic "Optimally-calibrated non-invasive feedback improves amputees' metabolic consumption, balance and walking confidence". J Neural Eng (2022).

AM Georgarakis, M. Xiloyannis, P. Wolf, P. et al. "A textile exomuscle that assists the shoulder during functional movements for everyday life", Nature Machine Intelligence (2022).

M. Helmberger, K. Morin, B. Berner, N. Kumar, G. Cioffi, D. Scaramuzza, "The Hilti SLAM Challenge Dataset", Robotics and Automation Letters (RAL), 2022

F. Mahlknecht, D. Gehrig, J. Nash, F. M. Rockenbauer, B. Morrell, J. Delaune and D. Scaramuzza, "Exploring Event Camera-based Odometry for Planetary Robots", Robotics and Automation Letters (RAL), 2022

D. Mantegazza, A. Giusti, L. Gambardella, J. Guzzi, "An Outlier Exposure Approach to Improve Visual Anomaly Detection Performance for Mobile Robots", IEEE Robotics and Automation Letters, (2022).

R. Penicka, Y. Song, E. Kaufmann, D. Scaramuzza, "Learning Minimum-Time Flight in Cluttered Environments", IEEE Robotics and Automation Letters (RA-L), 2022.

V. Polizzi, R. Hewitt, J. Hidalgo-Carrió, J. Delaune and D. Scaramuzza, "Data-Efficient Collaborative Decentralized Thermal-Inertial Odometry", IEEE Robotics and Automation Letters (RAL), 2022

A. Romero, R. Penicka, D. Scaramuzza, "Time-optimal Online Replanning for Agile Quadrotor Flight", IEEE Robotics and Automation Letters (RA-L), 2022.

W. D. Shin, W. Stewart, M. A. Estrada, A. J. Ijspeert, and D. Floreano, “Elastic-actuation mechanism for repetitive hopping based on power modulation and cyclic trajectory generation”, IEEE Transactions on Robotics, 2022

Z. Sun, N. Messikommer*, D. Gehrig, D. Scaramuzza, "ESS: Learning Event-based Semantic Segmentation from Still Images". European Conference on Computer Vision (ECCV), Tel Aviv, 2022.

S. Sun, A. Romero, P. Foehn, E. Kaufmann, D. Scaramuzza, "A Comparative Study of Nonlinear MPC and Differential-Flatness-Based Control for Quadrotor Agile Flight", IEEE Transactions on Robotics, 2022.

* Selected publications include those that have been notified to the editor. All members are kindly encouraged to inform the management team of new publications. Read all publications.

NCCR Robotics

The Swiss National Centre of Competence in Robotics (NCCR Robotics) is a federally funded programme bringing together robotics laboratories from EPFL, ETH Zurich, University of Zurich, IDSIA, UNIBE, EMPA, University of Basel and SUPSI to work on wearable, rescue and educational robots.

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