

RoboCup Humanoid League 2020: Lessons Learned From Going Virtual

By Maïke Paetzel

Since 1997, RoboCup has been an annual event that hosts competitions in several different areas related to robotics and artificial intelligence [1]. Preparing for the 24th edition, the RoboCup Federation made the difficult decision to postpone RoboCup 2020 due to COVID-19. Thus, 2020 marks the first year in the history of RoboCup that no annual competition was held, leaving many teams no possibility of testing the research progress they had made during the past months. RoboCup is, however, more than a mere competition—first and foremost, it is a strong community for sharing, discussing, and collaborating on robotics research. While amplifying the potential negative

consequences that canceling RoboCup has for individual researchers and laboratories, this element of RoboCup also bears the potential for going virtual.

Most presentations were recorded and are freely available on the RoboCup Humanoid League website.

The RoboCup Humanoid League’s organizing committee decided to provide a platform for open workshops to be held during the original June 2020 time slot for RoboCup. In total, the Virtual RoboCup Humanoid Open Workshops (V-RoHOW) brought together 144 participants from

21 countries and included 26 different teams and five different leagues (Figure 1). With 57.1% and 28.6%, respectively, the majority of teams usually compete in the Humanoid League and the Standard Platform League. The V-RoHOW attracted additional participants from the Small Size, Soccer Simulation, and RoboCup@Home Leagues, thus bringing together different research foci within the RoboCup competition. The event was centered on 11 talks and four workshops, conducted by 22 presenters and five invited speakers from 11 different teams. Some of the talks introduced theoretical approaches to RoboCup-related problems, like improving robot vision by using 3D instead of 2D object models (Figure 2) or enhancing simulation images using generative adversarial networks. The workshops, on the other hand, gave comparable practical intro-

ductions to topics like the Robot Operating System (ROS) 2 (Figure 3), among others. The presentations and workshops often provided a starting point for in-depth discussions that continued among smaller groups in several text and voice chats provided by the organizers. Most presentations were recorded and are freely available on the RoboCup Humanoid League website (<https://humanoid.robotcup.org/virtual-rohow-2020/program/>).

Virtual workshops cannot replace the knowledge gained and scientific progress made by having real robotic competitions. However, holding such an event for the first time provided us with several insights of importance for future RoboCup events and could potentially translate to other competitions as well.

During a competition, the focus is on technical preparation: While there are

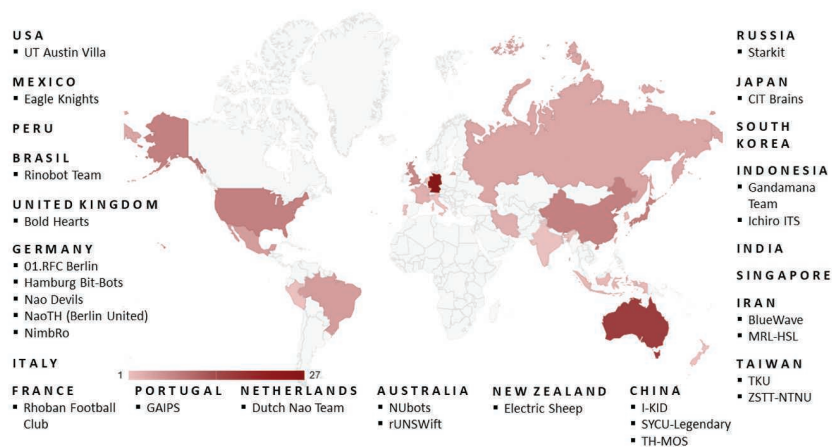


Figure 1. An overview of countries and RoboCup team affiliations for the V-RoHOW 2020 participants.

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many opportunities for discussions among teams, they are naturally quite short. Most teams are intently focused on their own preparations for the tournament, and competition days are generally long and filled with challenges that require immediate solutions. The symposium held on the day after the finals is fully dedicated to scientific research, but its program is also packed. Virtual workshops like the V-RoHOW enable dedicated, meaningful, and in-depth discussions among a large, interested audience not only within a league but also within the RoboCup community as a whole.

- *Virtual workshops significantly extend the possibilities for individual teams to connect with others independent of their geographic location:* In Europe, for example, many teams come together several times a year to participate in regional events, like the

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$$r = f\theta$$

Great for wide angle lenses, distances in pixels linearly maps to angle

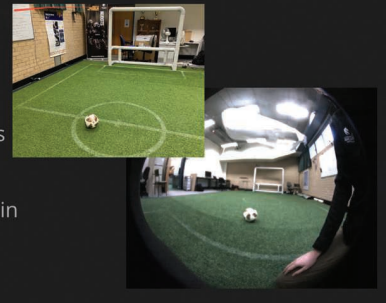


Figure 2. As an example of the talks introducing theoretical approaches to RoboCup-related problems, Trent Houliston (NUbots) gave a presentation entitled "Computer Vision is a 3 D Problem."

RoboCup German Open, and in one (or several) multiday workshops organized by local teams to test their robots under realistic conditions. For teams from areas with few other

teams in close proximity, engaging in exchanges like these becomes difficult and expensive. Such disadvantages for a particular team (which also limit the scientific progress of

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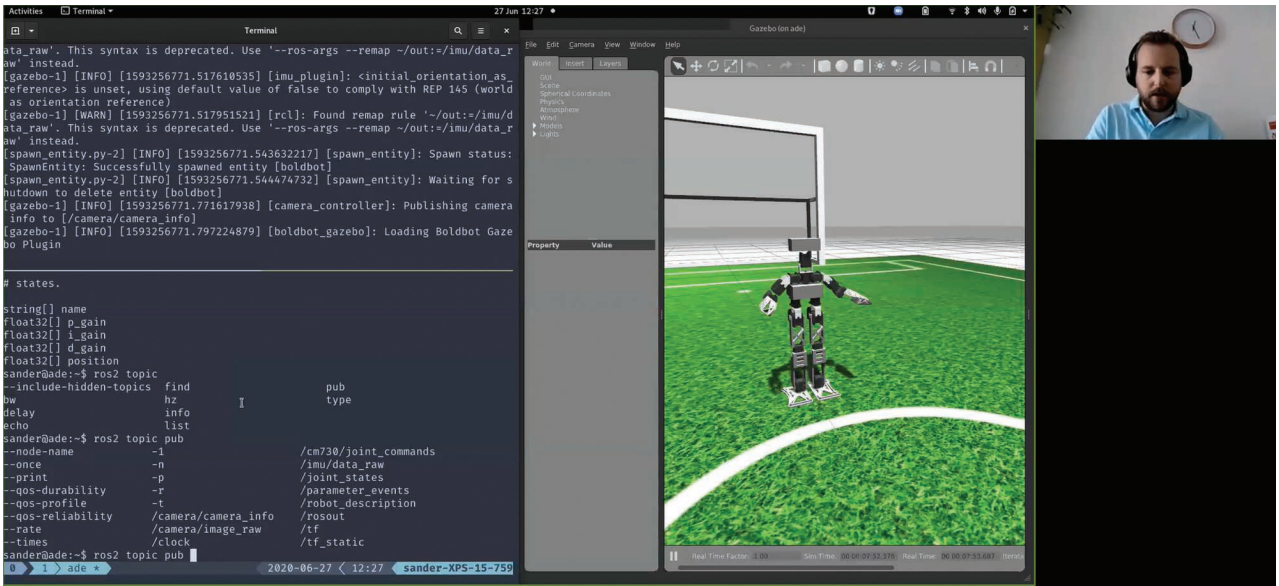


Figure 3. Sander van Dijk (Bold Hearts) gave a hands-on workshop introducing ROS 2.

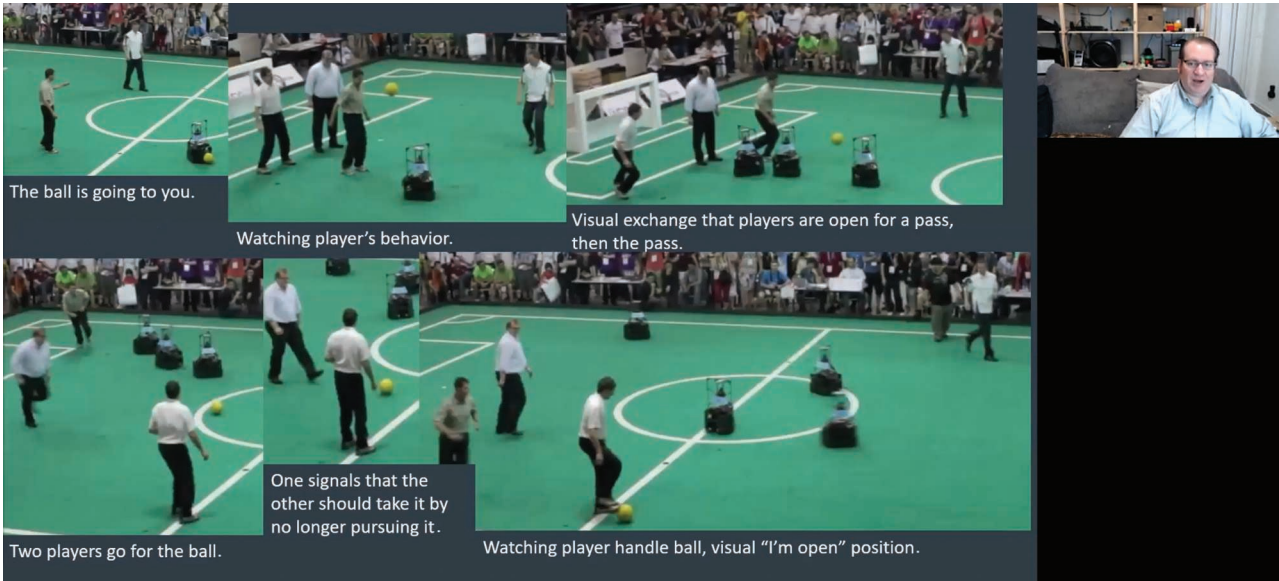


Figure 4. Invited speaker Justin Hart from the RoboCup@Home league talked about human soccer players using body language to communicate strategy.

the entire league because not all teams have equal access to contribute) can be overcome by virtual workshops.

- *Virtual workshops strengthen cooperation among different leagues having significant thematic overlap but limit the occasions for cooperation available in physical events:* Promoting exchanges among the RoboCup leagues could accelerate research progression within each league. One such example is the experience

with human-robot interaction gained in the RoboCup@Home league, which can be of future benefit for the soccer leagues (Figure 4). Following RoboCup's "moonshot" goal of competing and winning against the human world champions by 2050, robot teams will start to play against human soccer teams in the not too distant future. If the models of human behavior developed in the RoboCup@Home league could be transferred to the

soccer leagues, this would contribute to research achievements on the path to 2050.

Based on these insights, the RoboCup Humanoid League is determined to organize more frequent virtual events throughout the RoboCup year to foster discussion and collaboration across teams from different parts of the world. To make these events even more inclusive, we are looking into solutions to lower language barriers, which now

exclude several teams from participating in such exchanges. In addition, for the first time, we will host the Humanoid Research Demonstration during RoboCup 2021 in Bordeaux, France. Researchers are invited to submit their demonstrations on humanoid robotics independent of whether they participate in RoboCup competitions and sym-

posia or even have a RoboCup team. The focus of this event will be on showcasing work in progress and developments from areas not previously applied (or applicable) to the RoboCup competition. The call for participation is already published and provides further details on the event (<https://humanoid.robocup.org/hl-2020/humanoid-research>

-demonstration-2/humanoid-research-demonstration/).

Reference

[1] M. Asada and O. von Stryk, "Scientific and technological challenges in RoboCup," *Annu. Rev. Control, Robot., Autonomous Syst.*, vol. 3, no. 1, pp. 441–471, 2020. doi: 10.1146/annurev-control-100719-064806



FROM THE EDITOR'S DESK *(continued from page 4)*

courtesy of a scientific mission based on openly available research data and transparent collaboration. Moreover, it is striking that the population trusts experts, with many becoming TV stars, while politicians bend their policies toward what science recommends as the most rational strategy (although it must also be said that it took a while to convince many such politicians). And

all this while scientists must continuously beg for money. However, (to paraphrase Bill Gates) that multibillion dollar investment now will save the trillions the pandemic would have cost in the future if we didn't have the scientists and their expertise. How we can do better going forward? It is not that scientists remain in their ivory towers these days; it's that their warning mes-

sages should be heeded earlier. We can't shut down the world again because science was ignored. Accordingly, we are currently in the process of a special issue dedicated to robotics and automation solutions to fight pandemics.

This month's issue of *IEEE Robotics and Automation Magazine* is a regular yearly issue. Enjoy!



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