

Humans and Robots Can Work Together

By Bram Vanderborght

Robots are often depicted as a curse in the media: they will steal our jobs and cause unemployment, companion robots and drones will harm our privacy, autopilots will take our lives, and so on. However, I have seen a great amount of interest from industry in our IEEE Robotics and Automation Society (RAS) conferences: interesting commercial demonstrations are given, the exhibition attracts more industries apart from traditional robotics companies, and relevant contests are organized by businesses such as Amazon and Airbus. Moreover, several relevant competitions have taken place in the past that demonstrated how,

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in the (close) future, robots will assist and help humans, with such examples being (and I cannot mention them all) RoboCup, the Surgical Robot Challenge (with a special issue on random-access memory scheduled in June 2017), and Cybathlon (with a special issue in December 2017; see the call for papers online). All of them have attracted a wide interest from the general public.

This December issue is the yearly regular issue, and it also demonstrates the rich variety of relevant applications that robots have; moreover, it is an extra-large issue to end 2016. Prof. Khatib and his team published, for example, the first scientific article about the Ocean One in

this issue. It is a bimanual underwater humanoid robot with haptic feedback that allows human pilots an unprecedented ability to explore the depths of the oceans in high fidelity. During the spring, they explored the wreck of *La Lune*, 100 m deep in the Mediterranean Sea, as a demonstration for future underwater tasks that are too dangerous for human divers. The photos alone are brilliant, and I am happy to see a collaborative task between a human and robot on the cover, since I am convinced that the complementary strengths of both humans and robots combined is the winning solution instead of simple human replacement.

This article also marks the beginning of a very exciting collaboration between this magazine and *IEEE Spectrum*, the flagship publication of the IEEE. We plan to work more closely with *IEEE Spectrum* editors to assist them in publishing news stories, Q&As with authors, and beautiful slideshows and videos showcasing articles from *IEEE Robotics and Automation Magazine*. The goal is bringing the great robotics research that appears on these pages to an even larger and more diverse audience.

Is this collaboration between humans and robots a blessing or a curse? I think we need to make it a blessing by developing an inclusive robot agenda. To achieve this, we need to continue to perform our cutting-edge fundamental research, turn it into useful applications, and valorize services and products so that it becomes accessible for society and the economy. Also, encouraging interactions between the general public and



policy makers to spark debate among them about the potential opportunities, as well as potential drawbacks and ethical concerns, is important to allow the acceptance of this emerging technology.

Moreover, we need to increase efforts in educating our future generations for those jobs in which robots do poorly, and more science, technology, engineering, and mathematics education should also be promoted.

In September, our Society was shocked by the unexpected loss of our dear member Fabrizio Flacco, who made impressive contributions in the field of safe physical human-robot collaboration, a core research aspect to make robots a blessing. He earned his master's and bachelor's degrees at the University of Pisa, Italy, and worked under the supervision of Prof. Bicchi. He earned his Ph.D. and postdoc degrees at the University of Rome, "La Sapienza," Italy, under the supervision of Prof. De Luca. During that time, he was a visiting scholar at Stanford University with Prof. Khatib. Later, he worked as a permanent researcher for the French National Center for Scientific Research at the Laboratory of Computer Science, Robotics, and Microelectronics, Montpellier, France. I think everyone who worked with or met him appreciated his great qualities as a person and researcher. My thoughts and deep condolences go to his wife Floriana, their two lovely daughters, family, friends, and colleagues. Let us continue the work of Fabrizio to make robots safer and more useful for humans and society.