Robotics in Human Environment: Challenges and Solutions

Uranchimeg Tudevdagva[1], Julien Vitay[2], John Nassour[3]

Call for submission. This editorial introduces the second issue of 2018 for *Embedded Selforganising Systems (ESS)* journal. The focus of this issue is Robotics and Embedded Systems.

Our journal uses electronic publication, which provides a flexible way to submit and review contributions of authors from all of countries. The advantages of such an e-journal are multifarious. In comparison to traditional paper journals, we replace the classic review and creation process with a new Sliding Issue model. Each issue starts with an initial editorial and an official call for papers. The submitted articles will be reviewed and, if accepted, published as soon as the final version is received by the committee. Based on this process, each sliding issue can be filled successively until the maximum number of article is reached. During this period, all accepted papers can, already be read by other researchers while other papers are still in the reviewing process. Accordingly, the time to publish shrinks to a minimum. In addition, multiple issues with different focus can co-exist at the same time, which provides completely new possibilities to react on latest research topics. The journal allows also the integration of discussions and other reactions on published articles in the same journal issue.

We are looking for fresh ideas, on-going research technical reports and novel scientific works. We also intend to create a promising platform for creative and constructive discussions.

Robotics in Human Environment: Challenges and Solutions

The world we are living in changes extremely fast, as technology is improving at an unseen pace. Smart mobile devices were luxury devices just a few years ago, while many people simply cannot imagine their daily life without them today. Robots are nowadays leaving the industrial or laboratory environments to reach people's homes, schools and workplaces, opening new opportunities for applications of embedded systems.

The arrival of robots in uncontrolled environments and in contact with humans is not without strong technical and ethical caveats. In 1942, the American science-fiction writer Isaac Asimov characterized three "Laws of Robotics" which became very famous in history of robotics [1]:

- Law One. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- Law Two. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- Law Three. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Is it possible or even desirable to implement these laws in today's robotic systems? Early attempts using symbolic systems failed as robots were not able to robustly link these

[1]Uranchimeg Tudevdagva
Chemnitz University of Technology, Germany
E-mail: uranchimeg.tudevdagva@informatik.tu-chemnitz.de
[2]Julien Vitay
Chemnitz University of Technology, Germany
E-mail: julien.vitay@informatik.tu-chemnitz.de
[3]John Nassour
Chemnitz University of Technology, Germany
E-mail: john.nassour@informatik.tu-chemnitz.de

concepts to their sensory space (grounding symbol problem). Sub-symbolic systems such as neural networks are nowadays the most promising method to control robots (defining the field of neurorobotics, which can be dated as early as the seminal work of Warren McCulloch and Walter Pitts in 1943), but as they rely heavily on learning and exploration, these rules cannot be explicitly enforced: they must emerge from interactions with other beings, just like humans do. How can robots learn from humans? How can they interact safely with them?

Recent advances in Artificial Intelligence, especially neural networks and deep learning, provide a lot of excitement in the robotics community. Successes in solving complex games (IBM's Deep Blue beating Garry Kasparov at chess in 1997, IBM's Watson winning Jeopardy in 2008, Google Deepmind's AlphaGo beating Lee Seedol at the ancient board game Go in 2016 [2]), understanding images, sounds, speech and controlling autonomous cars (the first self-driving car went for a drive in 1986) suggest that robots might soon be equipped with enough learning abilities to have human-like motor and cognitive behaviors, finally being able to learn Asimov's laws from experience. But what really happens in those black-box neural networks? How can we be sure that these laws will always be respected?

Safety and ethical concerns in robotics can be addressed at all levels. Hard robots made of metal and powerful motors can quickly be dangerous for humans if their motor control fails, leading to the emerging field of soft robotics (robots made out of soft materials). As any technology, robots are not neutral: they influence the humans they interact with, perhaps as much as they are influenced by them. The field of social robotics studies these interactions: can robots be helpful in social contexts? Won't they reproduce human biases (racism, etc.)?

Related to these ideas, we are inviting to submit your case studies, applications, original research and ideas (reviews, opinions) about the challenges and solutions in modern robotics.

Your contribution should cover the main topic of our issue. Potential topics include (but are not limited to):

- Safety for service or industrial robots
- Ethics in robotics
- Autonomous robotics
- Social robotics
- Robots in Education
- Neurorobotics
- Artificial Intelligence for robotics
- Soft robotics

We are expecting your valuable contribution to our Robotics in Human Environment: Challenges and Solutions issue! Looking forward to recieve your submissions.

Submission deadline: 30.11.2018
Review: 4 weeks after submission
Camera ready submission: 2 weeks after review
Publishing: 2 weeks after submission of Camera ready version

Thanks in advance for Your Contribution!

References

[1] Robotics: A Brief History, MOOC, Stanford university.

[2] Scott Carey & Laurie Clarke, “A brief history of robotics - a timeline of key achievements in the fields of robotics and AI, from Azimov to AlphaGo””, May 2018.