

Title: Autonomous Robot Evolution

Name: Wei Li
Fudan University, Academy for Engineering and Technology, Shanghai, China

This research will investigate the long-term vision of a technology enabling the evolution of entire autonomous robotic ecosystems that live and work for long periods in challenging and dynamic environments without the need for direct human oversight. Based on state-of-the-art 3D printing techniques with novel materials and a hybridised hardware-software evolutionary architecture - the research will address current weaknesses in robot design methodology by establishing self-reproducing robots that evolve their morphologies and controllers in real-time. Imagine an environment where autonomous systems (robots) are not designed by humans (or indeed designed at all) but are created through a series of steps that follow evolutionary processes. These robots will be "born" through the use of 3D manufacturing, with novel materials and a hybridised hardware-software evolutionary architecture. "Child" robots will learn in a safe and controlled environment where success will be rewarded. The most successful individuals will make available their genetic code for reproduction and for the improvement of future generations. Such a process will ultimately lead to a change in the way things are designed and manufactured. The long-term vision is a technology enabling the evolution of entire autonomous robotic ecosystems that live and work for long periods in challenging and dynamic environments without direct human oversight. This means radically new autonomous systems are needed, where robots are conceived and born, rather than designed and manufactured. Such robots will fundamentally change the concept of machines, showcasing a new breed that can change their form and behavior, not in error but on purpose.

Biography

Wei Li received the B.Eng. degree in automation and the M.Eng. degree in control science and engineering from the Harbin Institute of Technology, China, in 2009 and 2011, respectively, and the Ph.D. degree from the University of Sheffield, U.K., in 2016. He is currently an Associate Professor with the Institute of AI and Robotics, Fudan University. He has published more than 30 academic articles in peer-reviewed journals and conferences, such as the IEEE Transactions on Robotics and NeurIPS. His research interests include robotics and computational intelligence, and especially self-organized systems, and evolutionary machine learning.

Presenting author details
Full name: Wei Li
Contact number: +86-13122528775
Email: fd_liwei@fudan.edu.cn
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