

Smart robots from Delft conquer the world

RoboValley leading in tech transfer

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Winning the Amazon Picking Challenge showed the world that something special is happening in Delft when it comes to intelligent robots. One of the driving forces behind this success is Professor of Biorobotics Martijn Wisse (1976), one of the founding fathers of RoboValley. He outlines a fascinating long-term vision, in which smart robots from Delft conquer the world.

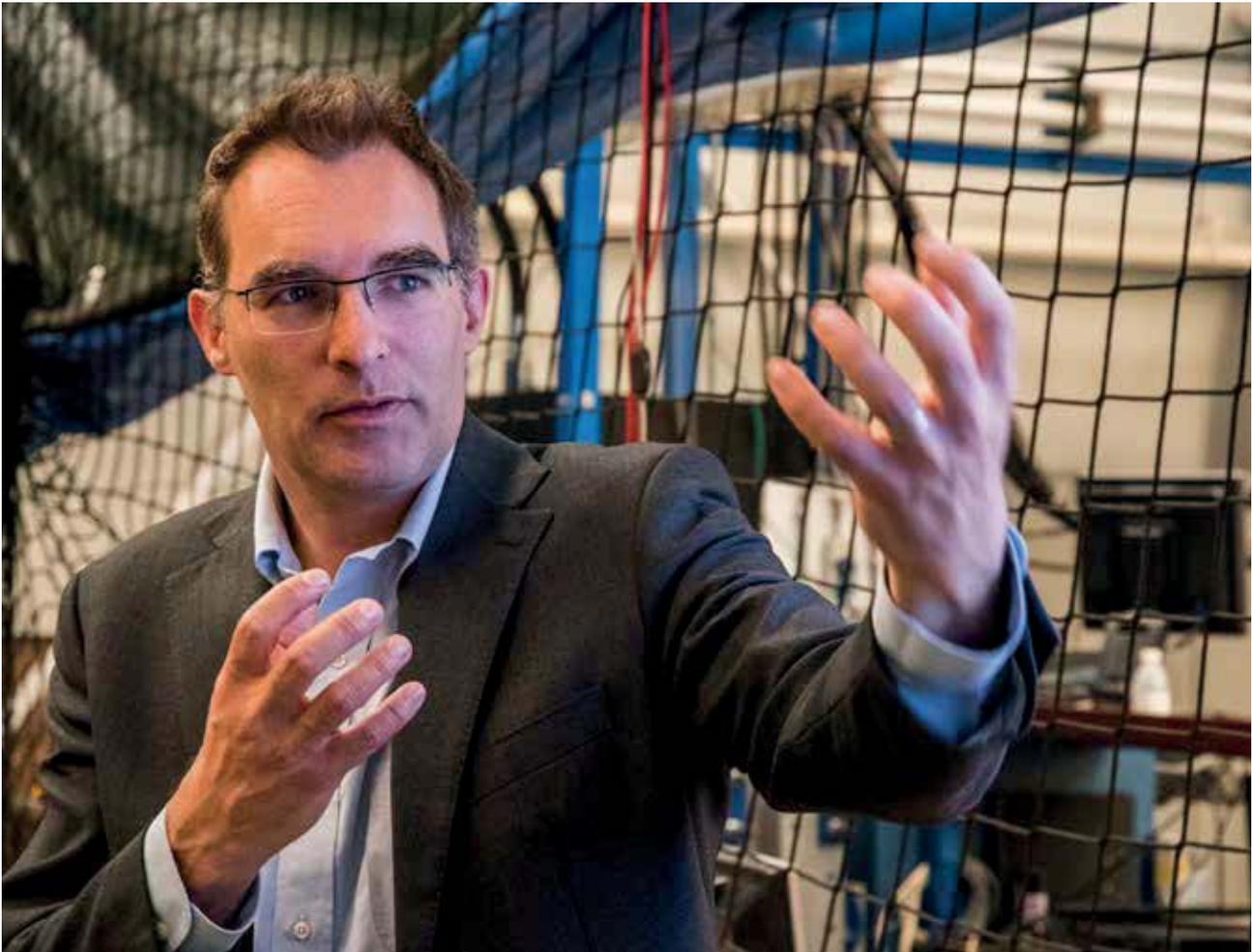
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“**W**ow, that was impressive!” The jury member from Amazon was expressing his amazement at the robot arm designed in Delft, after it was first demonstrated in the Leipzig conference centre where the RoboCup was taking place. The Yaskawa arm with its specially designed ‘gripper’ had just clocked the fastest time of all sixteen robots in the final of the Amazon Picking Challenge (APC). For the Challenge, robots must sort parcels completely autonomously, in the same way as the people who work in the warehouses of the online seller. Amazon not only praised the speed at which the Team Delft robot arm sorted items, but also the industrial ‘look’ of the machine. While duct tape was clearly visible on most of the other designs, the robot arm from Delft was robust and sleek. In fact, the system looked ready for use. The robot uses deep learning, a form of artificial intelligence, to recognise objects. It was set up and ‘trained’ by the team consisting of staff from the start-up company Delft Robotics

and researchers from the TU Delft Robotics Institute. In Leipzig, they competed against, and beat, teams from several renowned universities including the American MIT. Wisse was the one who decided that Delft should take part in the APC. “I watched the contest last year and having seen what our team is capable of, I thought: this title should be ours for the taking.” The software was the decisive factor in the team’s triumph. “We have fantastic software developers. Their software turned out to be perfect for the various tasks the robot had to perform.”

FACTORY-IN-A-DAY

The win at the APC is the most important success to date in the EU Factory-in-a-Day project, also conceived by Wisse. The project, which involves several universities and companies working together under his leadership, aims to reduce the time taken to integrate robots into production processes to just a single day. At present, this can take months. These plug-and-work robots will mainly benefit medium-sized and small businesses, which are currently unable to afford robotic solutions.



Martijn Wisse, Professor of Biorobotics, explains biorobotics at the Cyber Zoo in Delft. (Photo: Michiel Wijnbergh)

“Factory-in-a-Day is actually the result of a valorisation activity,” explained Wisse. “We had done some research into mini-grippers to be used in processing vegetables and fruit. Lacquey, a company that produces robot grippers, evolved from this project, but it was a long time before the company was able to produce a complete robot. So I thought: perhaps this needs more research. I started looking and soon realised that almost the entire small and medium enterprises sector had the same problem.”

With help from the Valorisation Centre of TU Delft, a grant application was submitted and honoured, and Wisse went in search of European parties to work as partners on the project. They included the Technical University of Munich and the electronics concern Philips. It was a great success. “We’d hit the nail on the head. Requests for affordable

robot systems poured in.” Many of them involved concrete requests from companies wanting to implement robot systems. But this was not in the university’s remit. So having said ‘no’ three times, they decided to set up the Delft Robotics company.

WORLD TOP

“Winning the Amazon Picking Challenge shows that we currently lead the world in system integration,” says Wisse. This is difficult to gauge and only becomes obvious in contests of this kind. “It’s not top-end science, because we don’t publish in Science. But it’s not a huge commercial success either, because if it were, we’d be installing systems at companies rather than taking part in contests like this. We’re right in the middle: it shows that we are extremely active precisely in the field of tech transfer.” Both parties are now working to capitalise on their win. >>

ROBOVALLEY

More than 170 robotics researchers from a range of disciplines work in RoboValley, alongside experts, entrepreneurs and decision-makers from both the public and the private sector. The result is a unique network, with the TU Delft Robotics Institute as the nerve centre. RoboValley leads the way in designing next-generation robotics. Some 30 startup companies are based in RoboValley, alongside established robotics companies. The expectation is that in the next ten years, some 15,000 to 25,000 jobs will be created in RoboValley and between 250,000 and 360,000 m² in office and lab space will be required for these companies. The Canadian Chrysalix recently announced its intention to invest € 100 million in RoboValley.



The Yaskawa arm holding on to its Amazon picking Challenge 1st price award.

The researchers are busy writing papers about the software used for the Amazon Picking Challenge, and Delft Robotics is letting potential customers know what it is capable of. This is attracting new customers. There's also been another success: Wisse has just heard that the European Union awarded his team with a Horizon2020 grant to continue developing the underlying open source software system.

ROBOVALLEY

The step from 'tech transfer' to RoboValley was soon made. Wisse was one of the driving forces behind the 'Silicon Valley of robotics,' set up almost a year ago. But working in such an exciting environment isn't just 'cool'; RoboValley is a vital way of introducing robotics into society. "Robotics is a highly

multidisciplinary, extremely complex field, and it will only be successful if everyone (and I mean everyone) works well together. This requires a solid network."

There is a huge social demand for robotics. "We really need to get a move on developing these robots. If we don't, we'll soon find ourselves in the situation where the population has aged so rapidly that our workforce simply isn't big enough."

A number of different partners are needed if RoboValley is to be a success. "You need someone for business development, someone who can identify opportunities and knows which players you must put in touch with each other. And then of course you need someone willing to invest, someone with a long-term vision: the Valorisation Centre. Paul Althuis has taken this on, and I'm very grateful to

him for taking such a broad view and having the courage to invest."

DRONES

RoboValley showcases all the 'invisible technological feats' taking place at TU Delft. The drones and MAVLab of Bart Remes and Guido de Croon, who have been at the top of their game in scientific research for many years, are a good example. "They produce fantastic miniature auto-pilots (one of their more powerful technologies), but thanks to the involvement of RoboValley, it is now so much more than just a lab," explains Wisse. "It's a hive of activity. Seven or eight startup companies are all working to get this technology onto the market, leaving the researchers to get on with their side of the work."

TU DELFT ROBOTICS INSTITUTE

The nerve centre of RoboValley is TU Delft Robotics Institute, a common ground for all the researchers working on robotics within TU Delft. They develop the new robot technology and train new engineers. But it would all grind to a halt without RoboValley. “People would spread themselves throughout the industry, and you’d be lucky to end up with any kind of network. RoboValley strengthens their ties with the institute. Most of the startup companies you come across in Delft are in some way connected to one of the researchers from TU Delft Robotics Institute.”

INTELLIGENT ROBOTS

The world of robotics is developing rapidly, particularly the field of artificial intelligence. “This field is growing exponentially. Today’s fast computer is tomorrow’s slow telephone, as it were.” It’s becoming easier and cheaper to produce intelligent machines, making them a logical alternative to manpower for many applications. “There will be a lot of new applications that hadn’t been worth developing before.” Data collection is a good example. “Drones have provided us with heaps of information about the condition of the dykes and water levels, and about animal populations in the wild.” All kinds of new applications will

emerge during the next decade. “You can’t say: first this sector, then that one. That’s not how it works. One or two worthwhile applications will suddenly be developed in every sector.”

INTERACTION BETWEEN MAN AND MACHINE

One of the main topics being researched concerns how to operate these new, intelligent machines. “If a machine is autonomously intelligent and makes its own decisions, it will become increasingly difficult for man to understand and operate it.” A lot of research is needed before we can operate them easily and intuitively. “This is something that TU Delft is working on. The field of robotics is immense, but the interaction with man is one of the biggest scientific challenges.”

RoboValley is set to lead the way in the field of applications that have not yet been invented. Wisse predicts that the startup companies currently focusing on niche applications will eventually expand to become leading companies. “In the long term, I expect to see the maritime sector, the agricultural sector and logistics making the switch to robotics.” Although Germany and Japan will still lead the way in the field of ‘traditional robots’ such as those used in the automotive industry, we have now entered an era of

intelligent robots, and RoboValley has a good chance of taking the global helm.

To achieve this, it is important not only for new companies to come to the region, but also to raise awareness in Delft. This is a task for RoboValley. In turn, this will secure more involvement from the local government and attract new talent to TU Delft. “These aspects enhance each other and enable new growth, which is valuable and essential.”

COMMERCIAL SUCCESS

The Factory-in-a-Day project is due to run for another year and a half. Despite the successes, Wisse is not entirely satisfied. “I still want to see a demonstration in which we actually develop a robot system in a short space of time.” There are still issues with the software, so this will be the main focus in the near future. Wisse also hopes that Philips will implement the robot system developed by Factory-in-a-Day for its shaving device production line. “The research is finished. That’s great, but I won’t be happy until it’s commercially up and running.” Another way of measuring success is to see Delft Robotics growing by double-digit figures. “If it doubles every year because you have so many customers, then you’ll know that you’re making a serious impression on the market.” <<

FACTORY-IN-A-DAY

European small and medium-sized businesses rarely make use of advanced robot technology. The EU ‘Factory-in-a-Day’ project is an attempt to change this situation by developing a robotics system which can become operational within 24 hours and is flexible, inexpensive and can be leased. The project was awarded € 11 million over four years, € 7.9 million of which came from the European Union as part of the FP7 programme ‘Factory of the Future’. The international consortium consists of sixteen partners led by TU Delft. Dunja Swierstra from the Valorisation Centre is the project manager in charge of the administrative, legal, financial and organisational support aspects of the project. The Valorisation Centre has vast experience with large-scale projects of this kind, involving multiple partners. Thanks to the broad network of the project management team, the Valorisation Centre has managed to unite all the partners in a highly successful consortium. Swierstra and her team provide timely reports and ensure that all the partners comply with the EU guidelines, and she herself acts as contact person for the EU.



(Photo: TU Delft, Robotic Institute)