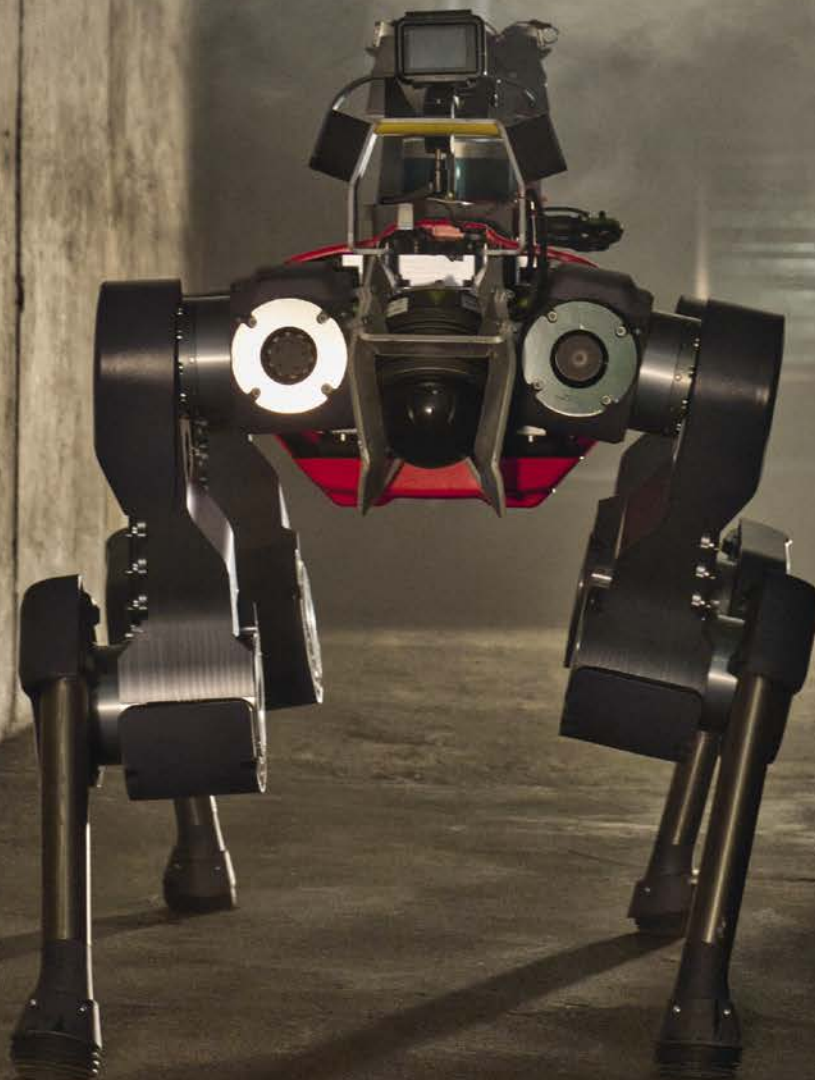




# Swiss robotics for the disaster relief of the future

Reports about new robots and drones appear almost every day. Whether remote-controlled or autonomous, they are meant to be used for a whole range of applications – one day.

**Text:** Dr Markus Höpflinger





A four-legged walking robot moving autonomously in the respiratory protection training facility of the Swiss Armed Forces.


Reports about robots and drones are pouring in on almost every media channel. We read about a future in which autonomous vehicles will deliver hot meals to our tables by air, and self-driving taxis that will take us to hospital. We learn about humanoid robots that check us in to hotels and help us to shop, and about other systems which offer no direct human benefits but are capable of completing obstacle courses and doing somersaults. We see videos of a particularly human-looking robot called Sophia debating and holding speeches. We also learn that Sophia was the first robot in the world to be given citizenship, in Saudi Arabia in 2017.

Robotic technology already seems advanced.

### More illusion than reality

But a closer look behind the scenes is often sobering. Sophia, for example, is regarded by experts in artificial intelligence and robotics as more like a doll, a puppet without any intelligence, feelings or understanding of what she is saying. It is a robot with no legs that has to be physically pushed onto stage to give a speech and only repeats what a person is inputting in the background. This shows that machines like these have definitely not yet found their way into everyday civilian life.

In the military sphere, robotics is regarded as an area of disruptive technology. It is changing the way war is waged, ushering in a new area. Robots are sometimes even described as the next generation of weapons of mass destruction. But



**ARCHE**

ARCHE stands for Advanced Robotic Capabilities for Hazardous Environments and is an annual event of the Swiss Drone and Robotics Centre (SDRC). The aim is to assess the status of technology and the ability to use Swiss robotics for disaster relief in future. Robots are meant to support humans in what is known as 4D activities (dull, dirty, dangerous, denied). This should improve the efficiency and effectiveness of disaster relief and reduce deployment risks.

here too, as in civilian life, autonomously acting robots have not yet found their way into everyday military routine.

The Swiss Drone and Robotics Centre (SDRC) of armasuisse S+T, together with their other partners, is examining when robots will make their way into the Armed Forces, as well as how and for what purposes they might be used in future. In close cooperation with the Engineering/Rescue/ABC Training Unit of the Swiss Armed Forces, the SDRC assesses robotics for the military disaster relief of the future. The use of robots for disaster relief seems to be ideal: robots can perform tasks that are dangerous or simply not feasible for soldiers. They can perform valuable support work by saving lives faster and more carefully without endangering troops. To better investigate these applications, the SDRC set up a working group: "ARCHE - Swiss Robotics for the Disaster Relief

*In the event of disaster, robots can perform tasks that are either dangerous or not feasible for soldiers.*



A research drone is used for three-dimensional measurement of the environment. The map can then be used to plan missions.

Robots often have to interact with the world around them.







of the Future”, together with the Swiss Armed Forces and ETH Zurich. This ARCHE group is intended to bring robotics researchers and military end-users closer together, in order to be able to coordinate robotics research and its future use. In addition, it lets the university partners test and check their robot demonstrators not just in the laboratory, but also in a more realistic disaster environment. The annual highlight for all those involved is the eponymous ARCHE event.

**ARCHE – the largest field robotics event in Switzerland**

For one week a year the Swiss Armed Forces make a training environment or a complete training village available to research partners from academia, SMEs and start-ups. This contains houses that are half-demolished or on fire, as well as systems for large-scale fire and flood simulations. Researchers can test their latest robots focused on disaster relief, and gather data, experience and ideas for further research

and development. This year’s ARCHE event saw a worm-like rescue robot, four-legged walking robots for search and rescue operations, and a multicopter for measuring damage to buildings and detecting radioactivity.

The Swiss Armed Forces, in turn, have the opportunity to experience at first hand the current status of robotics technology. Although the focus is on disaster relief, findings on other military applications can also be made: if a four-legged robot that looks like a dog is able to find an injured person in a pile of rubble, the same technologies can be used to perform surveillance and combat tasks in other similarly complex environments. So ARCHE provides insights into further applications, as well as

*The SDRC launched the “ARCHE - Swiss Robotics for the Disaster Relief of the Future” working group to aid enquiries in this field.*

The largest four-legged robot at the SDRC has been equipped with a gripper, which enables objects weighing several tons to be moved.







Representatives of the Engineering/Rescue/ABC Training Unit of the Swiss Armed Forces, academia and industry meet at the ARCHE week.



potential threats from robots. The event has been taking place annually since 2018 – and has been growing steadily. With around a hundred students, researchers and developers in the training village at the same time, along with a variety of robotic demonstrators, ARCHE is the largest Swiss event for examining robotic applications.

**A constantly growing subject area**

The ARCHE working group is also increasingly investigating other applications as well as disaster relief. In 2019, defence from minidrones was added as an area and since 2020 recovering wounded people and clearing munitions has been examined even more intensively. Thanks to ARCHE,

the application maturity of specific robot technologies can be assessed.

From today’s perspective, the broad technology of mobile robotics is still not mature enough to provide significant assistance to first responders when recovering people or saving lives. However, in disaster relief in particular, robots offer major potential for supporting rescue services quickly and safely. It is essential that this potential is exploited in the future.

*The ARCHE working group is also increasingly investigating other applications as well as disaster relief.*



**DR MARKUS HÖPFLINGER**  
Head of research programme and Head of SDRC

Dr Markus Höpflinger is head of the Unmanned Mobile Systems research programme as well as Head of the Swiss Drone and Robotics Centre (SDRC) at armasuisse Science and Technology. His work focuses on the possible use of robot and drone technologies in the military environment. This includes assessing the opportunities and risks of unmanned systems for applications on the ground, under water and in the air. Dr Markus Höpflinger holds a master’s degree in Electronics and Information Technology from ETH Zurich, worked subsequently in space robotics and then went on to earn a doctorate in walking robotics.

The Swiss Armed Forces’ training village in Wangen an der Aare offers various options for testing robots in a realistic environment.