

ROBOTS AND SOCIETY

Robotics in Africa is trending upward and has a bright future

David Vernon*

Robots are being deployed in many sectors in Africa, from agriculture to education, and research activities are growing fast.

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Robotics is perhaps not the first discipline that comes to mind when thinking of Africa. However, just as Africa has embraced its sister discipline, artificial intelligence (AI), robotics has an important role to play in the inclusive digital transformation of African economies. Today, it is having a positive effect on many sectors, from agriculture to medicine, education, and logistics.

The robots currently deployed in Africa come in many forms: social robots, such as those deployed in Rwanda during the pandemic, and four-armed surgical robots, such as those in operation at the Tygerberg public hospital in Cape Town, South Africa. In 2019, the government of Rwanda announced a collaboration with L'Institut de recherche contre les cancers de l'appareil digestif (IRCAD) to build a center in Kigali to train surgeons to use surgical robots. IRCAD Africa, the African Center of Excellence in Minimally Invasive Surgery, is now fully operational.

Drone robots play an increasingly important role in agriculture, supporting small holder farmers. For example, pest management is being deployed by Aerobotics, South Africa, using their Skybugs drone technology. In the field of medical logistics, Zipline has been successful in using fixed-wing drones with a range of more than 100 km to deliver blood supplies to remote rural locations in Ghana, Rwanda, Nigeria, Cote d'Ivoire, and Kenya (1, 2). In the security industry, Enova Robotics, in Tunisia, produces PGuard surveillance robots.

The importance of robotics in Africa is underpinned by the existence of the African Robotics Network (AFRON), a community of institutions, organizations, and individuals working in robotics in Africa. Its goal is to promote communication and collaboration that will support robotics-related education, research, and industry on the continent.

Launched in 2012 and with more than 400 members from 51 countries in Africa, it is currently transitioning to a new identity as AfRob and actively seeking new members.

In 2024, robotics in Africa was featured at the landmark celebration of the 40th anniversary of the Institute of Electrical and Electronics Engineers (IEEE) International Conference on Robotics and Automation (ICRA)—the premier robotics conference—in the ICRA@40 Africa workshop. This event highlighted the contributions that African researchers have made to ICRA over the past 10 years, from the first paper by an African university—the University of Cape Town—at ICRA 2014 in China (3) to the papers at ICRA 2024 in Yokohama (4, 5).

ROBOTICS EDUCATION AND RESEARCH

There are many champions for the deployment of robotics in Africa. For example, Ayorkor Korsah at Ashesi University, Ghana, has ignited a passion for science, technology, engineering, and mathematics (STEM) education in Africa and was a keynote speaker at ICRA 2015. Since then, the use of robots to motivate STEM education has grown consistently. For example, the Pan-African Robotics Competition (PARC), founded in Senegal by Sidy Ndao and held there again in 2024, attracts teams from 37 countries in Africa. It is notable that PARC has recently added a fourth league to its competition, focusing on agriculture and advanced tools that are commonly used in industry, for example, the Robot Operating System (ROS), Gazebo, OpenCV, and the Scout robot. Other competitions include the national Robotics inspired Science Education (RiSE) Competition organized by the Ghana Robotics Academy Foundation and the Cars4Mars African Rover Challenge in South Africa to

design and build a Mars rover prototype. In 2019, an all-girls robotics team from Ghana won the World Robofest Championship in the United States.

Many companies also feature in the STEM education space: Fundi Bots in Uganda, Keza Education Future Lab, Creativity Labs, and New Generation Academy in Rwanda. Indeed, robotics in STEM is set to become mainstream in Rwanda, with the government of Rwanda partnering with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH to launch the National Robotics Program in 2024. The pilot program involves 33 teachers from 26 schools. So far, 452 robotics kits have been distributed to support STEM education.

Formal education in the discipline of robotics is offered by many universities, as well as training institutes, such as RAIN: Robotics and Artificial Intelligence Nigeria. There is even a Bachelor of Science in robotics engineering offered by Academic City University College in Ghana.

Research in robotics is being pursued at several universities and research labs, such as the Robotics, Autonomous Intelligence, and Learning (RAIL) Lab at the University of the Witwatersrand; the African Robotics Unit at the University of Capetown; and the AI & Robotics Lab at Carnegie Mellon University Africa, with a dedicated forum for sharing results at the Robot Learning for Africa Workshop, in conjunction with Deep Learning Indaba.

THE ROBOTICS COMMUNITY IN AFRICA

The bright future of robotics in Africa was highlighted by the seven speakers at the Robotics in Africa Forum at the International Conference on Intelligent Robotics and Systems (IROS) in 2024, one of the biggest robotics conferences worldwide. They illustrated the work happening in the field across the African continent, from cutting-edge research to practical industrial applications, education,

Carnegie Mellon University Africa, Kigali, Rwanda.

*Corresponding author. Email: dvernon@andrew.cmu.edu



Melinda Mudzurandende, a student at Carnegie Mellon University Africa, working on a project to equip a Uniree Go2 quadruped robot with the ability to learn how to act by observing how other agents act.

and training, showcasing the state of robotics in Africa.

The future is all the brighter when you consider the caliber of African people working in the field, both those who are located here—Paul Amayo (University of Cape Town, South Africa), Ayorkor Korsah (Ashesi University, Ghana), Ndivhuwo Makondo (IBM Research, Kenya), Pravesh Ranchod (University of the Witwatersrand), Sekou L. Remy (Google, Kenya), Benjamin Rosman (University of the Witwatersrand, South Africa), and Aisha Walcott-Bryant (Google Research Africa, Kenya)—and the diaspora with strong links to the continent—Chinwe Ekenna (University at Albany, State University of New York, USA), Marwa ElDiwiny (Vrije Universiteit Brussel, Belgium), Kenechukwu Mbanisi

(Olin College of Engineering, USA), Sidy Ndao (University of Nebraska-Lincoln, USA), Daniel Omeiza (Oxford Robotics Institute, United Kingdom), Amir Patel (University College London, United Kingdom), and Addisu Taddese (Vanderbilt University, USA)—not to mention the many African students pursuing PhD degrees in robotics around the world. This is a small and incomplete sample, but the message is clear: Robotics in Africa is in good hands and in reasonably good shape.

CHALLENGES

Why just “reasonably” good shape? Because, as Amir Patel argued in his talk at the Robotics in Africa Forum at IROS 2024, several challenges remain. These include limited

access to advanced education and a low number of PhD students, limited access to high-performance computing, the high cost and limited availability of robotics hardware, insufficient national research and development (R&D) investment, sparse distribution of research institutions with limited intra-African collaboration, and visa restrictions that inhibit international travel and collaboration. However, the difficulty of these challenges is balanced by the immense enthusiasm and optimism of the robotics community in Africa, the gathering momentum of its activities, and the increasing awareness worldwide of the potential of robotics in Africa. The future of robotics in Africa is bright indeed.

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