

Robotics in Korea

By Frank C. Park

South Korea is a mostly homogeneous nation with a population of 50 million, situated in a geopolitically sensitive area with China to the west, Japan to the east, and North Korea (and beyond, Russia) to the north. Although technically occupying a peninsula, with North Korea cutting off all land access to the main Eurasian continent. For the past 60 years, South Korea has effectively been an island nation. In 1953, the year of the armistice agreement that ended the Korean War (technically a cease-fire, and not a peace treaty—North Korea still claims to have won the war), South Korea's per capita income stood at US\$67. In 1997, the Asian financial crisis required a US\$55 billion International Monetary Fund bailout to avert sovereign default.

By most measures, Korea has recovered quite efficiently from these historical nadirs. Today, Korea's export-driven economy ranks as the world's 12th largest, with companies like Samsung, Hyundai, and LG, and a robust sector of midsize manufacturing and technology companies, establishing a global pres-

ence in the electronics, automobile, shipbuilding, machinery, and petrochemical industries.

If things work out as planned, then in the not-too-distant future, robotics is set to join this list of major Korean industries. Since 2003, robotics has been targeted by the government as a major economic growth engine. In 2008, South Korea's parliament passed a "special law" to promote robotics as a technology and industry—essentially, a long-term robotics stimulus package, parceled out in five-year installments. Thereafter, major government ministries through programs coordinated by the newly formed Korea Institute for Robot Industry Advancement (www.kiria.org)

have invested around US\$1 billion (this figure is approximate, and does not include, e.g., local government matching funds) to develop a national robotics infrastructure.

Although Korea has a free market-based, capital-driven economy, the government initiatives have played an important role in establishing new industries. There has also been little if any ideological debate surrounding such proactive measures. Early government investment in a national broadband infrastructure has, most would

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Figure 1. The exhibits at Robot World 2012, KINTEX, Korea.

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Korea is particularly well positioned for a strategic push in robotics. With its strong manufacturing, electronics, and IT sectors ready to take advantage of emerging robotics and automation technologies, high-speed broadband and wireless networks connecting most households and public places, and a well-educated public that embraces new technologies, the conditions are ideal for a robotics revolution to take root in Korea. Some of the early investments in robotics are beginning to pay off. The domestic market size for industrial and service robots was estimated at US\$2 billion for 2011—representing a 20% increase from 2010—and Korea's world market share was estimated at between 10 and 15%. Exports for 2009 ranged around US\$100 million, with recent annual growth figures estimated at between 10 and 20%.

Major Initiatives and Activities

The major centers of activity in robotics are spread out over government and corporate research centers, universities, and various private enterprises. The first large-scale robotics initiative in Korea was the Center for Intelligent Robotics (CIR,

www.irobotics.re.kr) at the Korea Institute of Science and Technology (KIST). Established in 2003 with a ten-year budget of US\$90 million, the CIR's focus is on developing the fundamental technologies that will provide an infrastructure for a future robotics industry, e.g., design, actuation, sensing, manipulation, task planning, and control.

The recently established Center for Human-Centered Interaction for Co-existence (CHIC, www.chic.re.kr) is another long-term, government-funded initiative—whereas CIR focused on physical and lower-level issues, CHIC is focused more on higher-level problems in multimodal interfaces, human-robot interaction, virtual environments, and ambient intelligence.

In addition to coordinating the CIR and CHIC centers, KIST also has an active internal research unit in neurocognitive, medical, and rehabilitation robotics (bionics.kist.re.kr). The Robotics Department at the Electronics and Telecommunications Research Institute (www.etri.re.kr) focuses on network robot and cognition technologies. The Korea Atomic Energy Research Institute (www.kaeri.re.kr) develops robots for operation in nuclear reactors, whereas the Agency for Defense Development (www.add.re.kr) is engaged in developing defense and military robotics technologies. The Korea Institute of Industrial Technology (eng.kitech.re.kr) has developed several mobile and humanoid robot platforms intended for applications ranging from household cleaning to entertainment, and also has an active research group on wearable robots and underwater robots.

The Open Platform for Robotic Services (OPRoS, opros.or.kr) is another major government-funded

initiative launched in 2007 to develop a component-based open source platform for robotics software development. OPRoS offers an environment for developing and integrating components, monitoring and debugging, simulation, and execution on physical hardware, with a repository for components and proxy services as well as test and verification.

Major universities active in robotics research include Seoul National University, Korea University, and Hanyang University in Seoul, Sungkyunkwan University in Suwon, the Korea Advanced Institute of Science and Technology in Daejeon, and Pohang University of Science and Technology in Pohang. The Seoul Robotics High School may be the first and only public high school in the world devoted to robotics education.

Quite possibly another first of its kind in the world, Robot Land, a US\$600 million theme park featuring attractions and exhibitions, is (barring further delays) scheduled to open in Incheon sometime after 2015.

The major robotics societies in Korea are the Korea Robotics Society (www.kros.org) and the Institute of Control, Robotics, and Systems (eng.icros.org). Robot World (www.robot-world.or.kr), the largest robot-themed exhibition and show bringing together all the major companies and research institutions in Korea, is held annually in the fall.

Although the government's initial plan to place a robot in every South Korean household by 2020 may seem overly ambitious, it is likely a safe bet that Korea will continue to be in the vanguard of robotics, offering a fascinating glimpse of a society in which robots become a ubiquitous part of everyday life.

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