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Robotics Revolution – Robots in Homes and Hospitals

An aging population in industrialized and post-industrial countries will drive the development of a plethora of new, autonomous robots for homes and hospitals. Researchers are working on advanced robotic systems to assist healthcare workers and the elderly. The growth of the robotics market will provide numerous jobs for mechanical engineers and provide them with opportunities to take leadership roles in solving many social problems.

The number of robots in operation worldwide is forecasted to grow from 6.7 million in 2007 to more than 18 million in 2011 according to the International Federation of Robotics. Robots dominate industries such as automobile manufacturing, packaging and the production of circuit boards. Robots are also making inroads into the military. The Pentagon will spend \$4 billion by 2010 to improve robot autonomy, while Congress set a goal to replace one-third of ground combat vehicles with unmanned vehicles by 2015. This increased military spending on robot R&D will have spill-over effects in the civilian sector. For example, improving robot autonomy can be applied to robots in disaster zones, hospitals, or the average American household. While the U.S. leads the way in research on robotics for military applications, Japan is pushing the boundaries for robotics in the civilian sector. The Japanese company Cyberdyne recently released the [Hybrid Assistive Limb \(H.A.L.\)](#) - an external robotic exoskeleton suit designed to increase the strength and stamina of the human body. Much of the technology used in H.A.L. was pioneered in the United States through a series of DoD funded projects. Exoskeletons could have a wide range of civilian uses from patient rehabilitation to improving patient mobility and assisting nurses with moving patients.

Robots are already in development, or currently used, for many tasks usually performed by nurses, home health workers and surgeons. Courier robots such as [the TUG robot](#) can be found in hospitals ferrying around linens, medications, laboratory samples, and supplies. Though the Japanese have been leading the way in integrating robots into the medical system, robots can be found in many other countries, as well, allowing for the best doctors to perform surgeries without leaving their home hospital. The first fully autonomous system conducted unassisted surgery to correct

heart arrhythmia in an Italian patient in 2006 and was overseen by a surgeon in Boston. Robots will increasingly fill operating rooms, and will replace many surgeons, particularly in hard to reach rural areas, over the next 15 years. Both Japanese and U.S. researchers are working on an array of devices for home monitoring and other tasks. A number of domestic robots have made headway in the home such as robotic vacuum cleaners, lawn mowers, pool cleaners, pet care and even as pets. Robots are currently in development to assist with monitoring patients inside their homes, aiding in memory tasks, preparing medications, preparing meals and contacting medical personal in case of an emergency. Researchers in Japan are also working on developing robots designed to act as companions for the elderly to help them deal with loneliness and depression.

ASME Implications

ASME can take a leadership role to promote the involvement of mechanical engineers in the growing field of robotics for home and healthcare. The U.S. currently spends significant sums for the development of military based robotics. However, the translation of that research to civilian applications often lags other nations such as Japan or South Korea. ASME can look at ways, with their partner associations and organizations, to encourage more research on the civilian application of robotics in healthcare and other areas. Advances in robotics can play an important role in managing the aging population of the developed world, filling in for shortages of healthcare workers, improving care and reducing costs.

Mechanical engineers will play an important role in the development of the mechanical, sensor and software systems that run advanced robots. However, the complexity of the next generation of robots means mechanical engineers will be challenged in the areas of systems integration and partnering with other scientists and engineers needed to innovate in this area. ASME should continue to support the development of systems thinking and multi-disciplinary collaboration in new engineers and as part of the continuing education of its members.

By taking a lead in this area, ASME can help meet the following strategic objectives:

- Better serve our core customers (C1)
- Secure, serve and incorporate emerging markets and technologies (C2)
- Develop new and expanded market relevant content (I2)
- Provide effective representation and advocacy for the engineering profession (I3)