WASEDA UNIVERSITY USES PTC® PRO/ENGINEER® TO DEVELOP A “HUMAN-SYMBIOTIC” ROBOT

Cabling Capability Overcomes Difficult Challenges In The “TWENDY-ONE” Project

NEEDHAM, MA – December 15, 2008 – PTC (Nasdaq: PMTC), The Product Development Company®, today announced that Pro/ENGINEER®, PTC’s parametric, integrated 3D CAD/CAM/CAE software, has been selected by Waseda University’s Sugano Laboratory as the main engineering tool for the development of a humansymbiotic robot. In fact, Pro/ENGINEER was able to address one of the most significant challenges in the project related to the cabling design for robotic joints.

The human-symbiotic robot called “TWENDY-ONE” is a jointly researched and developed by Sugano Laboratory (headed by Professor Shigeki Sugano, Department of Modern Mechanical Engineering, Waseda University) and private-sector businesses. Professor Sugano is well known for his research in the area of arm and finger manipulations. In 1999, his team developed “WENDY” (Waseda Engineering Designed sYmbiont), a human symbiotic robot that had “dexterous” hands with human-like fingertips and succeeded in breaking an egg flawlessly for the first time in the world. Professor Sugano’s team made full use of Pro/ENGINEER to develop “TWENDY-ONE,” a prototype of the new generation human-symbiotic robot being developed based on the “WENDY” technology for supporting daily human activities.

The project team used the Pro/ENGINEER Piping and Cabling Extension, which enables users to define cable properties parametrically and to find optimal routes automatically. Because more actuators and sensors are required to enhance the robot’s capability, the team had to increase the number of cables. Additionally, as the team deploys higher-output actuators, thicker cables had to be introduced, making cabling design a major challenge in developing high-performance robots. “TWENDY-ONE” has a large number of sensors and actuators all over its body, which inevitably requires many cables and advanced engineering techniques. But with the advanced cabling capabilities of Pro/ENGINEER, the project team succeeded in generating accurate cable routings just by specifying certain points on the cable routes and also in updating the cable design automatically when changes were made.

“We must be very careful about the appearance and the materials used when we design the outer shell of a human-symbiotic robot because the robot should never hurt the humans or the surrounding environment on its contact,” says Professor Sugano about the design requirements enabled by the Pro/ENGINEER Piping and Cabling Extension. “Also, the appearance is very important from an affinity standpoint. Exposing many cables outside the robot’s body shell could create major problems, and therefore, we must place all cables inside the shell. Furthermore, cables must be compact in order not to interfere with moving parts. We could use piping or solid models to define cable models, but with the specialized cabling capabilities in Pro/ENGINEER, we can define the properties of the cables and create cable models while we see how the cables behave.”
“When a cable route is updated based on a design change, the cable often sticks out of the allowable space. Pro/ENGINEER gives me that information immediately,” says Yohei Uemura, a second-year mechanical engineering master’s program student. “The tool also enables us to perform mechanical and cabling designs concurrently while graphically viewing the orientations and locations of the circuit boards and their relative positioning. Also, cables can be ordered accurately since accurate lengths of the cables can be obtained. We were actually able to assemble the ordered cables with little deviation, just like I viewed in the CAD tool. That was extremely impressive.”

“Pro/ENGINEER Piping and Cabling Extension has been enhanced and refined over the years to increase the ease of use and breadth of cabling design capabilities.” says Michael Campbell, senior vice president, Product Management, PTC. “With the ability to define cable properties as parameters, Pro/ENGINEER enables users to update cable models automatically when there is a change, and therefore, cabling and mechanism designs can be performed seamlessly. Regarding the “TWENDY-ONE” project, Waseda University’s Sugano Laboratory members were able to fully utilize such capabilities of Pro/ENGINEER and develop an innovative humanoid.”

“TWENDY-ONE” photos:
* Human Symbiotic Robot "TWENDY-ONE"
http://www.ptcjapan.jp/pr/TWENDY/TWENDY-ONE-Default.html
* Hand & Arm having Original Passive Mechanisms
http://www.ptcjapan.jp/pr/TWENDY/Arm_ClosedShot.html
* Human Mimetic Multi-finger Hand with Distributed Tactile Sensors
http://www.ptcjapan.jp/pr/TWENDY/Hand_ClosedShot.html
* BackPack equipped with Controllers
http://www.ptcjapan.jp/pr/TWENDY/TWENDY-ONE-ErectBackView0.html
* An Example of Dexterous Manipulation "Straw Handling"
http://www.ptcjapan.jp/pr/TWENDY/TWENDY-ONE-StrawManipulating0.html
* Kitchen Tool Manipulation for Cooking Support

About TWENDY-ONE
TWENDY-ONE is a humanoid (height: 146.7cm, weight: 111kg) being developed for physical care and other purposes in a human-symbiotic environment, formerly introduced as WENDY (Waseda ENgineering Designed sYmbiont) in 1999. The robot is placed at the top of the field as the one that integrates hand and fingertip manipulators and other technologies at a very advanced level. The project has also attracted some attention from an educational point of view, as it gives the opportunity for students to learn the technology while nurturing a dream and gain some understanding of product development. For more information about “TWENDY-ONE,” please visit http://twendyone.com/index_e.html
About Waseda University
Waseda University is one of the top private universities in Japan celebrating the 125 anniversary from its founding by Shigenobu Okuma in 1882, with 16 departments, 23 graduate courses, 2 affiliated high schools and an art school as well as libraries, research institutes and research centers. It has approx. 50,000 undergraduate students and more than 500,000 graduates. Waseda University is devoted to the promotion of global education collaborating with 387 universities in 76 countries.

About PTC
PTC (Nasdaq: PMTC) provides leading product lifecycle management (PLM), content management and dynamic publishing solutions to more than 50,000 organizations worldwide. PTC customers include the world's most innovative companies in manufacturing, publishing, services, government and life sciences industries. PTC is included in the S&P Midcap 400 and Russell 2000 indices. For more information on PTC, please visit http://www.ptc.com.