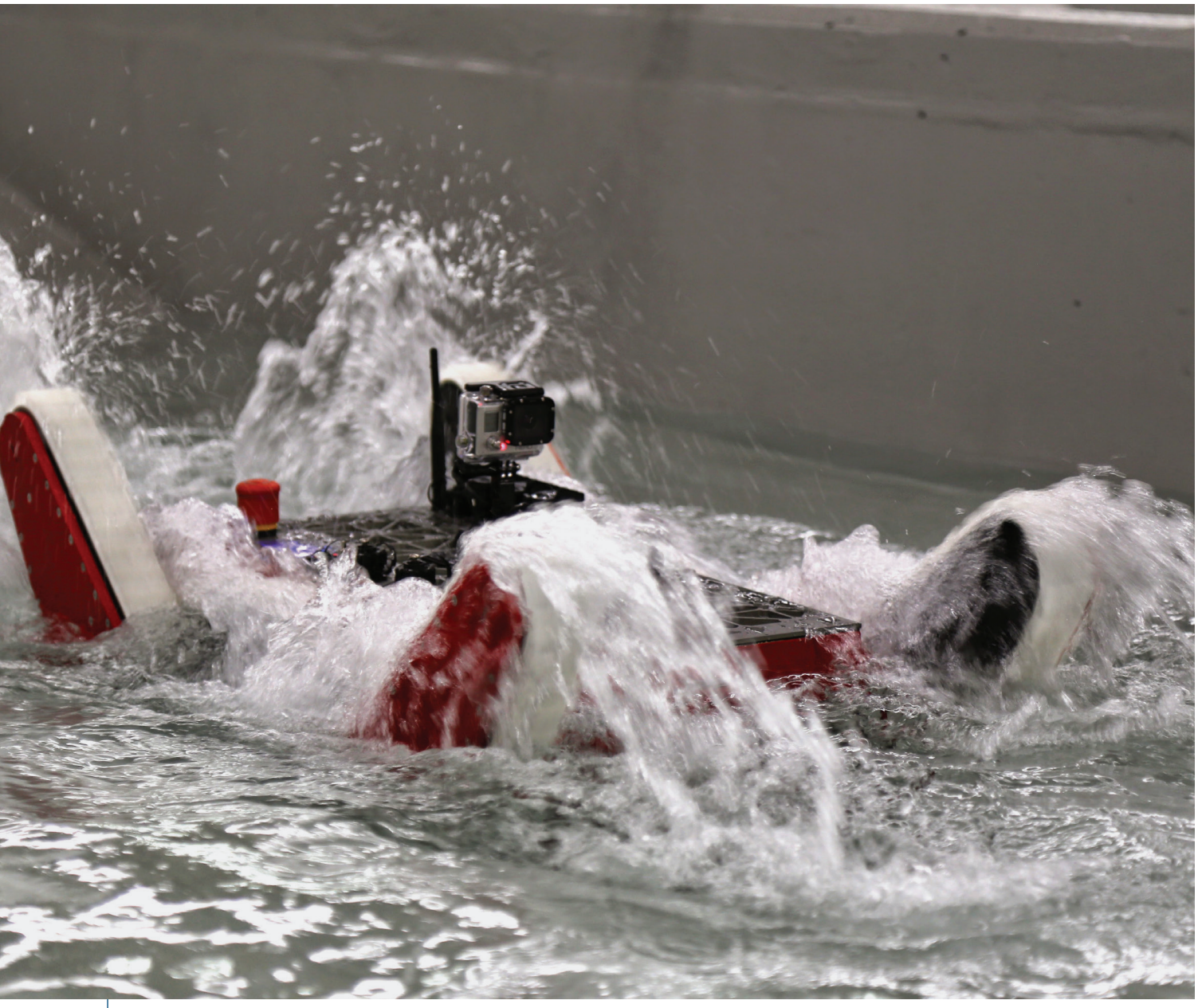
DASSAULT SYSTEMES

SOLIDWORKS

WORCESTER POLYTECHNIC INSTITUTE

PIONEERING FIRST ROBOTICS ENGINEERING DEGREE WITH SOLIDWORKS EDUCATION EDITION



Students in WPI's Robotics Engineering Program rely on SOLIDWORKS Education Edition software to complete innovative projects, such as the Water and Land Remote Unmanned Search Robot (WALRUS), which was developed to perform amphibious search and rescue operations during disaster relief.

WPI

Challenge:
Empower students and researchers to design and analyze robots and robotic components in the first undergraduate robotics engineering degree program in the United States.

Solution:
Utilize SOLIDWORKS Education Edition design software to support student projects and research.

Benefits:
- Launched first undergraduate degree in robotics engineering
- Implemented multidisciplinary engineering approach to robotics
- Supported innovative student projects
- Produced digital models for FIRST® Robotics Competition kits

Founded in 1865 to create and convey the latest science and engineering knowledge in ways that are most beneficial to society, Worcester Polytechnic Institute (WPI) has grown to become one of the world's leading universities specifically devoted to science, technology, and engineering education and research. To support its mission, WPI established its Robotics Engineering Program.

According to Robotics Engineering Program Director Michael A. Gennert, the program, which offered the first undergraduate degree in robotics engineering in the United States in 2007, serves two purposes: first, it helps prepare the robotics engineers of tomorrow; and second, it promotes robotics research at WPI with the goal of achieving advances and breakthroughs in robotics engineering.

"Designing and engineering robots demands that graduates see beyond the boundaries of traditional engineering to synthesize different disciplines," Gennert explains. "Because we can't squeeze three engineering degrees into a four-year program, our students take a selection of multidisciplinary engineering classes—including computer science and engineering, electrical engineering, and mechanical engineering—with an emphasis on student projects and real-world experience in robotics engineering."

To support projects in robotics engineering, WPI makes a range of 3D mechanical design and engineering software available to students. However, the most commonly used software for developing robots at WPI is SOLIDWORKS® Education Edition software. "While learning a CAD system is not necessary for taking robotics courses, students are encouraged to learn to use CAD to support project work at the upper levels," Gennert says. "SOLIDWORKS is by far the most popular software package that students use at WPI to design robots and complete projects related to the program."

DESIGNING AND SIMULATING ROBOTS

The reason why WPI students prefer SOLIDWORKS Education Edition software for robot-related projects is the software is not only easy to learn and use, but also provides access to mechanical design and finite element analysis (FEA) capabilities, both of which are critical to developing effective robots. "For robotics project work, students establish their own set of requirements and need feedback on the operation of mechanical and control systems without resorting to endless prototyping loops," Gennert points out.

"Students need access to serious design and analysis capabilities to successfully complete robotics projects—particularly with senior capstone projects," Gennert continues. "Because they can perform a full spectrum of design and analysis more easily with SOLIDWORKS software, students often prefer SOLIDWORKS for project work. SOLIDWORKS allows them to focus on robotics instead of the tool. In addition to leveraging SOLIDWORKS to support classwork and student projects, we also use SOLIDWORKS to perform research."

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— Michael A. Gennert, Robotics Engineering Program Director

INNOVATIVE STUDENT PROJECTS LIKE THE WALRUS

Since establishing the Robotics Engineering Program, WPI has seen more innovative student projects that deal with the interaction of science, technology, and society. For example, senior T.J. Watson worked with a five-member team to develop a Water and Land Remote Unmanned Search Robot, better known as the WALRUS rover, after learning about search and discovery limitations following the Sept. 11, 2001 terrorist attacks through discussions with industry professionals. The rover was created to perform amphibious search and rescue operations during disaster relief.

"Although there are land-based and underwater search and discovery robots, there's nothing that works with mixed terrain, where you're dealing with land, water, and deep mud," Watson explains. "The WALRUS is designed to fill that void."

"I use SOLIDWORKS software exclusively because it provides access to the broadest base of capabilities. In the case of the WALRUS rover, structural and transient response analyses were especially helpful," Watson adds. "I performed FEA on the clutch system and also verified that we can dunk the WALRUS in a tub of bleach for sterilization."

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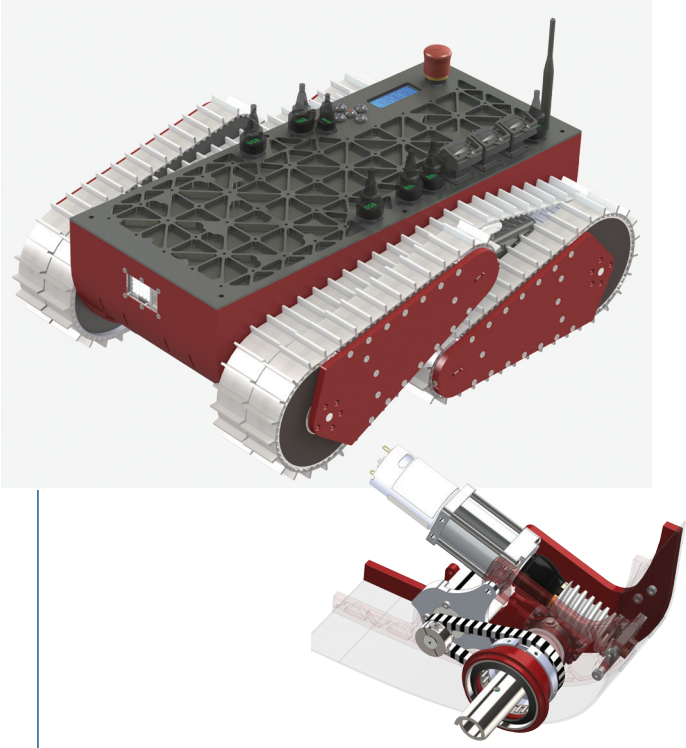

With SOLIDWORKS Education Edition software, students can not only model robot designs in 3D but also take advantage of integrated motion, analysis, and visualization tools.

SUPPORTING EARLY ROBOTICS EDUCATION WITH FIRST

In addition to using SOLIDWORKS software to support robotics projects, WPI students utilize SOLIDWORKS to perform community outreach and stimulate interest in robotics among younger students. For instance, junior Gabrielle Fanzini used SOLIDWORKS software to create more than 300 models of mechanical and electrical components and assemblies included in the kits that high school students use in conjunction with the FIRST Robotics Competition.

"The FIRST Robotics Competition is touted as the 'varsity sport for the mind™,' and gives middle and high school students the opportunity to compete while learning how to design and build robots," Fanzini says. "FIRST participants can now download the models that I created for the kits from the SOLIDWORKS website [www.solidworks.com/FIRST], then use these models to design their robot with SOLIDWORKS prior to fabrication and assembly, providing them with valuable experience by working in the same manner as robotics engineers do."