ENGINEERING

Bots on a Budget

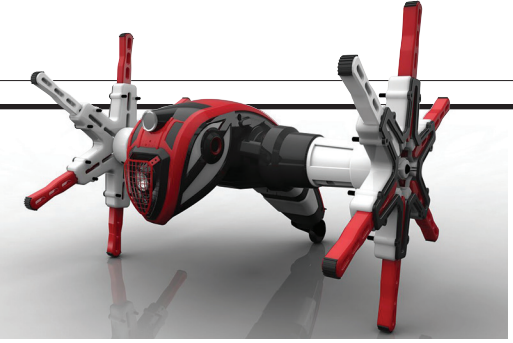
More consumer-friendly droids and drones might come from an unexpected place

The robotic butlers and sentries of sci-fi fantasies already roam our planet, but you can't have them—not yet. The fate of most would-be home robots breaks in one of two ways: Bots such as Honda's Asimo, a bipedal assistant, exist only as demonstrations from multimillion-dollar research and development laboratories. Robots that consumers could purchase, such as the $1,600 Pepper companion robot, are unaffordable for most. Toy company WowWee aims to change all that when it delivers the first sub-$600 multifunction home-service robot. The freestanding, self-navigating Switchbot—part concierge, part security guard—will roll out in 2016.

Hong Kong–based WowWee's success stems from bringing university research projects to life that might otherwise languish in the prototype stage. A licensing agreement with the Flow Control and Coordinated Robotics Labs at the University of California, San Diego, for example, provides WowWee with access to patents and the labs with a healthy cash infusion. The collaboration has already netted a series of toy robots that balance like Segways. More recently, the avionics lab at Concordia University in Montreal began working with the company to perfect flight algorithms for a four-rotor drone. Next, chief technology officer Davin Sufer says he has his eye on the Georgia Institute of Technology and its work with swarming behaviors, which would allow a group of robots to function in tandem.

In the case of Switchbot, WowWee adapted a locomotion system developed in part by former U.C. San Diego student Nick Morozovsky. The robot moves on tank-tread legs either horizontally to navigate uneven terrain or on end to stand and scoot fully upright. Morozovsky built his prototype with off-the-shelf parts, including a set of $50 motors. The motors were a compromise; each one had the size and torque he wanted but not the speed. Over the past few years he has worked with WowWee to customize a motor with the exact parameters needed and to cut the final cost of the part down to single digits.

That back and forth yields low-cost, mass-producible parts, which means university-level robotics could become available to everyday



OutRunner

people. "One of the reasons I went into mechanical engineering was so I could create real things that have a direct impact," Morozovsky says. "I didn't expect that to necessarily happen in the process of grad school."

Academic research that translates directly to consumer electronics is rare, especially given how quickly WowWee can turn products around, says Fred Reinhart, president of the Association of University Technology Managers, which promotes transfer of intellectual property from universities to companies. But WowWee *has* to innovate quickly because toy companies need new stuff every year. Unlike a lab, "there isn't the luxury of being able to develop the technology just to see where it will take us," Sufer says. "That pressure makes cool things happen." —*Corinne Iozzio*

COURTESY OF WOWWEE

Tech Transfer

WowWee has a long track record of bringing lab-borne robots to reality

MiP *(mobile inverted pendulum)* The first product to come out of WowWee's collaboration with U.C.S.D, MiP's self-balancing system—including sensors, wireless radios, motors and processors—had to be reimagined to cut the cost of raw materials significantly.

OutRunner The spiky-wheeled land cruiser, based on an unfunded Kickstarter project by former Florida Institute for Human and Machine Cognition scientists, can hit speeds of up to 20 miles per hour. WowWee is working with the team to bring the prototype system's sticker price down from $500 to sub-$200, primarily by sourcing smaller, more efficient motors.

Switchbot The U.C.S.D. research project that led to Switchbot was about twice the size of the two-foot final product and cost nearly $1,800 in parts to build. To trim the price substantially, WowWee is working directly with suppliers and researchers to perfect new motors and balancing sensors.

Intellicopter WowWee has been paying attention to the shortfalls of many remote-controlled quadcopters—particularly that the learning curve for flying them is steep. That's why it is working with Concordia University researchers to create flight-control algorithms to help better train new pilots.

Switchbot