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The Linux operating environment keeps turning up in more and more nooks and crannies. At New York City's Wired NextFest, for example, Linux lurked hidden within robotic hands, "conversational" heads, and networked electronic musical instruments.

At a press preview of the recent show, huge exhibits near the front of the Jacob Javits Convention Center captured most of the limelight.

TV crews spent hours filming life-size models of the interior and exterior of forthcoming ShipShipTwo, put together by Virgin Galactic and Scaled Composites.

But by stepping deeper inside the cavernous hall, you'd come across a number of smaller pods, collectively forming "Robot Row."

Some of these pods were staffed by 20-something inventors, who happily acknowledged that their latest engineering feats run on Linux.

One of the small start-ups, Shadow Robot Company, showed off a robotic hand operating the Debian distribution of Linux.

With 36 different "muscles" on board, "Shadow Dextrous Hand" is meant to precisely duplicate the functionality of the human hand, said Matthew Godden, Shadow's senior robotics design engineer, in an interview at the Shadow pod.

"But the robotic hand can go where a human hand should never go," Godden told *LinuxPlanet*.

With that advantage in mind, Shadow gears its robotic device to applications such as armed combat and bomb detonation.

Although Shadow Dextrous Hand might behave like a human hand, it doesn't exactly look like one--not at this juncture, anyway.

Yet at Godden's invitation, *LinuxPlanet* shook Shadow's robotic hand. And to *LinuxPlanet*'s surprise, the machine responded with a firm but not unbearably heavy grip, just the sort of handshake that anybody's (human) parents would love.

A few pods away from Shadow, Hanson Robotics described and explained "Conversational Human Robots." As the name implies, Hanson's robotic heads are designed for schmoozing with people.

Currently, the talking heads run a hybrid mix of Linux, Macintosh, and Windows OS. But the vendor is working on phasing out some of the Windows, said David Hanson, company president.

The brains in the backs of the heads operate on Linux Gumsticks, according to Hanson. "These little Linux robots are about the size of your finger. They're ideal because they can run on low power," he told *LinuxPlanet*.

On the other hand, the company has picked Mac OS for "conversational AI (artificial intelligence)." Macintosh is relatively well advanced at pattern recognition, Hanson maintained.

Also under this hybrid OS model, Windows Embedded does most of the "machine vision" used for detecting motion. It thereby performs human "face tracking" for the computer system.

"Now, though, we've embedded some of the 'vision' into Linux," Hanson said. The company eyes moving more of this functionality to the low-power Linux Gumsticks soon.

The technology needed for the conversational app is packed into lifelike models of human heads.

But the Linux robotics at NextFest were hardly confined to body parts. At another pod, EnsembleRobot.org orchestrated and managed a trio of robotic musical instruments over a wireless LAN, from a laptop server running Linux.

EnsembleRobot.org's implementation complies with ALSA (Advanced Linux Sound Architecture), said Giles Hall, director of programming for the dot.org.

"ALSA is the de facto standard for music on Linux. It all starts with the Linux kernel," Hall told *LinuxPlanet*.

Yet beyond the technical merits of the operating environment, Hall has several other reasons for applying Linux to music.

"I was a computer science major (in college), and music is also a good fit for me," according to Hall.

"And I've been using Linux now for about ten years. I've met a lot of my closest friends through Linux. It's opened up a lot of doors for me."

What types of business models are the start-ups pursuing? Beyond its hybrid operating environment, Hanson Robotics also wants to retain a hybrid mix of open source and proprietary technology, according to the company's president.

As David Hanson sees things, the ideal ratio is 70 percent open source, versus 30 percent proprietary.

"But some potential investors get upset by (the idea of) open source," he told *LinuxPlanet*.

So to maintain financial independence, Hanson Robotics is now augmenting its work in conversational robotics by "selling robot heads" to other developers, he said.

One of Hanson's customers, the Korea Advanced Institute of Science and Technology, produced another exhibit at NextFest, a walking "Albert Einstein" robot.

In creating Einstein's head, Hanson Robotics included an "expressive face."

The Einstein robot, however, works solely on Windows XP, said Jun Ho Oh, Ph.D., director of the institute's Humanoid Robot Research Center.

Meanwhile, for its part, EnsembleRobot.org is presenting its Linux-driven musical

instruments on stage and on radio, according to Christine Southworth, president and artistic director.

Moreover, Shadow Robotics Company, makers of the robotic hand, is already attaining commercial success, Godden suggested.

As an indication, Godden pointed to contracts inked with both NASA and a major university in California.

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