

FutureTech: Shrikanth Narayanan

Shrikanth Narayanan has set remarkable goals — and made remarkable progress in realizing them. An associate professor of electrical engineering, computer science and linguistics, he has been zeroing in on natural communication modalities and finding ways to get machines to understand and seemingly empathize.

One element of self-expression is spoken language. On TV's *Star Trek*, all manner of strange beings used the Universal Language Translator, a simple little device that could instantly translate all known languages. This fiction solved problems so difficult that Narayanan calls them "one of engineering's holy grails."

Not that it stopped him from taking a careful swing at the problem. Drawing on expertise across school and university disciplinary lines, ranging from the Viterbi School's Information Sciences Institute to medical students at the Keck School, Narayanan has produced a laptop package called Transonics that translates a doctor's spoken English into spoken Persian, and the patient's Persian into English.

The system may be in emergency rooms in two years. And he has other even more remarkable inventions heading into the market. He holds 10 issued or pending patents and has published more than 150 papers. You could be seeing, or more likely

hearing, something created by Narayanan on a telephone number you will be calling soon.

Publications and broadcast media all over the world have been intrigued by his system for automated telephone answering machines that can tell whether a caller is angry, or becoming impatient, and then transfer them to a human. Besides relieving voice-mail frustration, Narayanan says such systems might someday live inside toys and games and listen to children for signs of frustration.

And not just listening. At Narayanan's SAIL (Speech Analysis and Interpretation Laboratory) researchers are developing the technology for language and literacy assessment in young children, especially those from bilingual backgrounds. The hope is to empower teachers with new tools and provide consistent and efficient assessment methods to target individuals.

Narayanan wants to make robot voices more natural and human sounding, even friendly. He has another computer system that synthesizes sound clearly recognizable as laughter so that a machine will sound happy rather than macabre to human listeners. With help from the School's computer graphics lab, an on-screen companion, or avatar, appears blinking and nodding when the computer talks.



An obvious benefit of this work will be machines that are much easier for humans to work with — machines that can understand human needs, anticipate questions, provide services.

"It is in that interface between humans and technology that a great many challenges lie. I believe we need to adopt a holistic approach and have no choice but to be interdisciplinary," says Narayanan. "Researchers are already building machines that can talk, listen, understand, respond, perhaps even laugh and sing. The greatest challenge is in how we can bring these together in meaningful and societally relevant ways. My vision is science that unravels some of the mechanism of underlying human traits, to create technology that can be in tune with these human traits and needs.

"I think USC is a place where this can be really done."