Robot-Man Partners to Take the Stage in Washington DC

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On September 16 robots will spend the day flying, hopping, scooting and just showing off in Washington DC at the invitation of the National Science Foundation (NSF). The most successful of them will be demonstrating ergonomics in action as well as advanced technology.

The robots are on a mission - to highlight the findings of the World Technology Evaluation Center International Study of Robotics. A report on the two year study, which evaluates robotics research and development in the United States, Japan, Korea and Western Europe, will be presented at the Washington DC event.

The energetic exhibits at the event will represent a new generation of robots: they cooperate with man on a more equitable basis than their predecessors, which were built on the master-slave model. Ergonomically speaking, the most successful of the new generation will be the ones with the most functional partnership with man - a partnership built on a solid understanding of what each does best.

There have been big advances, but the "gold standard" is still in the future. The Ergonomics report, a subscription publication for professionals requiring a deeper view of ergonomics, recently asked two robotics experts to define a successful man-robot partnership.

Dr. Bill Clancey, Chief Scientist at the Human-Centered Computing division of NASA Ames Research Center in California, described success as "developing a robot with its own research goals and competencies, so it could contribute a personal point of view, like a colleague." He noted it could take decades to understand how to develop this "conscious" robot. Dr. Clancey's robot-human partners would be sent to work on other planets or the Moon. For the present, they are earthbound, participating in experiments in a Utah desert environment that resembles distant Mars.

Dr. Martin Haegele, head of the Robot Systems division of the IPA Fraunhofer in Germany, used household tasks to explain a successful partnership. He noted that robot lawn mowers and vacuum cleaners are designed to carry out one task only, and that pressing a button is enough to activate the device. Future robot partnership should go beyond that, he said. A robot executing a broad spectrum of tasks in everyday environments has to be intuitively instructed, Dr. Haegele explained. "Instruction schemes depend on voice, gesture, tactile guidance of arms etc. A dialogue between robot and machine might be necessary to resolve difficult situations." He said researchers are still far from being able to instruct a machine the same way they can instruct a person.

Humans and robots need to communicate ergonomically - efficiently and without misunderstandings - and the robotics literature suggests many experts see this two-way understanding as the biggest challenge.

Scientists at the University of Karlsruhe in Germany are developing a robot

that communicates implicitly with its human partner. The means? Small biofeedback sensors that detect human stress by monitoring the activity of the human's heart. Their KAMRO robot detects panic, fear, anxiety or stress, then takes action to help. At some point in the future it will also be able to infer the human's state by reading gestures, facial expressions and intonation.

The Institut für Neuroinformatik (INI), a research institute at the Ruhr-Universität Bochum in Germany, is developing communication systems based on human gestures and the imitation of human actions. Providing the robot has a vision system that is sufficiently sensitive, it can understand sign language. The robot observes a human performing a particular task, such as grasping an object, and learns how the to perform the task from the human example.

Researchers at the University of Southern California are experimenting with body language to solve communication challenges. They are extending a robot's model of interaction with humans so it can induce changes in a human's behavior and express its intentions in a way people can understand easily.

The report delivered at the NSF event in September will reveal how US robots rank next to those from other countries. The exhibits promoting the study, meanwhile, can be ranked on the quality of the partnership with their operator.

Sources: *National Science Foundation, Dr. Bill Clancey, Dr. Martin Haegele; Institut für Neuroinformatik; U. Karlsruhe, U. Southern California.*

-- Jennifer Anderson

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