Science and technology news

Researchers study knife-wielding robots (w/ Video)
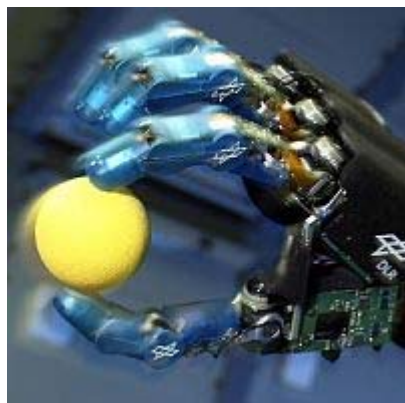
May 10, 2010 by Lin Edwards

Image credit: German Aerospace Center

(PhysOrg.com) -- Many people have dreamed of robots helping around the house, vacuuming the carpets, making the beds, and chopping vegetables in the kitchen. Now a new study has found such robots could pose a danger to humans if they use sharp implements such as steak knives.

The researchers were from the Institute of Robotics and Mechatronics, which is a branch of DLR, the German Aerospace Center at Wessling. They used a 14 kg DLR Lightweight Robot III robot arm capable of holding a range of knives, scissors, a scalpel, and a screwdriver. The articulated arm has a reach of 1.1 meters, and is moderately flexible, and unlike other robots is fitted with position sensors and torque sensors in every joint.

The aims of the experiments were to determine what would happen if domestic robots were trained to use bladed tools commonly found in the home and accidentally struck human soft tissue, and to develop a collision detection system to limit injuries. The results showed in some scenarios when the safety system was turned off the robots inflicted wounds that could have been lethal.

The robot arm was programmed to use the tools to cut, puncture, and stab at different speeds. Tests were carried out on a leg of pork and a lump of silicone, materials simulating human soft tissue. The robot used different maneuvers to strike the materials. Limited tests were also carried out on the arm of a human volunteer (leader of the research team, Sami Haddadin), and in this case a safety system including a prototype collision detector developed by the research team was turned on to limit injuries.

When the robot was used with the silicone and pork leg the safety system was turned off and the puncture and stab wounds produced by the robot arm were deep and in some cases would have been serious enough to be lethal if made on a living subject. With the safety system turned on the depth of cuts was reduced and sometimes were prevented altogether.

The research is believed to be the first to study injuries from bladed tools, although there have been studies of injuries that could be inflicted by robots bumping into people. The paper was presented last week by scientists Sami Haddadin, Gerd Hirzinger and Alin Albu-Schaffer at the IEEE International Conference on Robotics and Automation (ICRA 2010) in Alaska.

The scientists say they have reservations about ever training robots to use knives and other bladed tools in the home, but their research and the safety system they developed will help researchers to develop safer