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Human-Robot Interaction & Humanoid Robotics

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Background: Robots have evolved from continuous human-controlled master-slave servomechanisms for handling nuclear waste to a broad range of robots incorporating artificial intelligence for many applications and under human supervisory control.

Methods: My presentation describes HRI developments in application areas and what are the challenges for human factors research.

Conclusions: HRI is a rapidly evolving field. Specialized robots under human teleoperation have proven successful in hazardous environments and medical application, as have specialized telerobots under human supervisory control for space and repetitive industrial tasks. Research in areas of self-driving cars, intimate collaboration with humans in manipulation tasks, human control of humanoid robots for hazardous environments, and social interaction with robots is at initial stages. The efficacy of humanoid general-purpose robots has yet to be proven.

Applications: HRI is now applied in almost all robot tasks, including manufacturing, space, aviation, undersea, surgery, rehabilitation, agriculture, education, package fetch and delivery, policing, and military operations.

HRI can be divided roughly into four areas of application:

- (1) Human supervisory control of robots in performance of routine tasks. These include handling of parts on manufacturing assembly lines, accessing and delivery of packages, components, mail, and medicines in warehouses, offices and hospitals. Such machines can be called telerobots, capable of carrying out a limited series of actions automatically, based on a computer program, plus capability to sense its environment and its own joint positions and communicate such information back to a human operator who updates its computer instructions as required.
- (2) Remote control of space, airborne, terrestrial and undersea vehicles for non-routine tasks in hazardous or inaccessible environments. Such machines are called teleoperators if they perform manipulation and mobility tasks in the remote physical environment in correspondence to continuous control movements by the remote human. If a computer is intermittently reprogrammed by a human supervisor to execute pieces of the overall task, such a machine is a telerobot.
- (3) Automated vehicles in which a human is a passenger, including automated highway and rail vehicles and commercial aircraft.
- (4) Human-robot social interaction, including robot devices to provide entertainment, teaching, comfort and assistance for children, elderly, autistic and handicapped persons.