RI Overview

Robotics Institute
School of Computer Science
August 29, 2007 (11:00am)

Research Topic
Robotics

Research Problem
Can machines do what humans and animals do?

Problem Statement
Given the wide variety of activities (physical and cognitive) that humans and animals engage in, construct machines that can perform some of these activities as well as or better than we do.

Operational Definitions
Physical activities: Activities that require some form of coordinated motion, such as walking, driving, grasping and lifting.

Cognitive activities: Activities that require some form of mental processing, such as planning, reasoning and seeing.

Problem Description
The motivation for the research conducted by the Robotics Institute can be traced back to one question: can machines do what humans and animals can do? A related question is whether robots can exhibit awareness and purpose. Even seemingly simple biological tasks that a human or animal can perform without thought can be quite difficult for a robot to carry out. Many projects in robotics take their inspiration from the natural world and everyday life, while others are geared toward specific situations (such as a robot designed for search and rescue operations).

Computer Science Perspective
Many fields of computer science are involved in robotics. At a basic level, software needs to be designed to control the robot's motion and interpret input from its sensors (which in turn requires input from people working in fields such as computer graphics and speech recognition). Modern robots often also integrate machine learning algorithms into their programming, allowing them to adapt to new situations (such as encountering obstacles in an unfamiliar area). Human-computer interaction researchers contribute their knowledge to projects designing robots that interact with people.

Description of Disciplines Involved
Engineers (both mechanical and electrical) are involved in the design of the robots and their various sensors and components. Insights from psychology and sociology help RI researchers understand how people relate to robots and to design robots that can interact more effectively with humans. Many projects involve collaborations with specific groups relevant to the project's goals – for example, researchers designing robots for remote surgical operations might consult with physicians.

Actively Involved Disciplines
Computer science, HCI, mechanical engineering, electrical and computer engineering.

Operational Definition
Actively Involved Discipline: Any discipline from which one or more researchers made a significant contribution to the research design and interpretation of the results. Typically, the resulting research would add to the actively involved discipline's body of knowledge in some way, thus benefiting the discipline as a whole.

References
Robotics Institute homepage:
http://www.ri.cmu.edu/

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