HRI Theory and Evaluation

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Human Robotic Interaction

Study of interactions between humans and robots

 Multidisciplinary field with contributions from HCI, AI, Robotics, Design and Social Sciences

Provides information needed by both humans and robots at different levels of interactions

Norman's Model

- Formulation of goal
- > Formulation of the intention
- > Specification of the action
- Execution of the action
- Perception of the system state
- Interpretation of the system state
- Evaluation of the outcome

Norman's HCI Model



Norman's HCI Model

HRI Theory

- Can be explained using user roles
- User roles
 - Supervisor Interaction
 - Operator interaction
 - Mechanic interaction
 - Teammate interaction
 - Bystander interaction

Supervisor Interaction Model



Supervisor Interaction Model

Operator Interaction Model



Operator Interaction Model

Mechanic Interaction Model



Mechanic Interaction Model

Teammate Interaction Model



Teammate Interaction Model

Bystander Interaction Model



Bystander Interaction Model



HRI Evaluation

- Summative approach applied on a completed and implemented system
- Formative approach applied on the prototypes
- Formative approach is popular due to the low-cost and can deal with major and minor issues in early stages of development
- Example of formative approach Heuristic Evaluation

HRI Evaluation Process

Heuristic evaluation process

- Preparatory work Problem report templates, customization of heuristics
- Group of evaluators
- Independent assessments
- Aggregation of results

Standard Heuristics

- Standard Heuristics
 - Sufficient information design
 - Visibility of system status
 - Appropriate information presentation
 - Match between system and real world
 - Synthesis of system and interface
 - Help users recognize, diagnose and recover from errors
 - Flexibility of interaction architecture
 - Aesthetic and minimalist design

Heuristic Development and Validation

Heuristic Development and Validation

Create initial list of heuristics

- Modification of initial list based on pilot studies and consultation from experts
- Validation using existing HRI systems

HRI Challenges

- Multi-Modal Perception
- Design and Human Factors
- > Development/Epigenetic Robotics
- Social, service and assistive robotics
- Robotics for education

References



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