Human Robot Interaction in Medical and Rescue Contexts

Intelligent Robotics

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Gliederung

Outline

1. Human Robot Interaction
   - Motivation
   - Classification
   - HRI in Telerobotics
   - HRI in Autonomous Robotics

2. Rescue Applications
   - Motivation
   - Telerobotics
   - Autonomous Robotics

3. Medical Applications
   - Motivation
   - Telerobotics
   - Autonomous Robotics

4. Conclusion & Perspectives

A History of Robotics

Early Robotics:

- Navigation
  - Obersavtion of environment
  - Navigation
- Manipulation

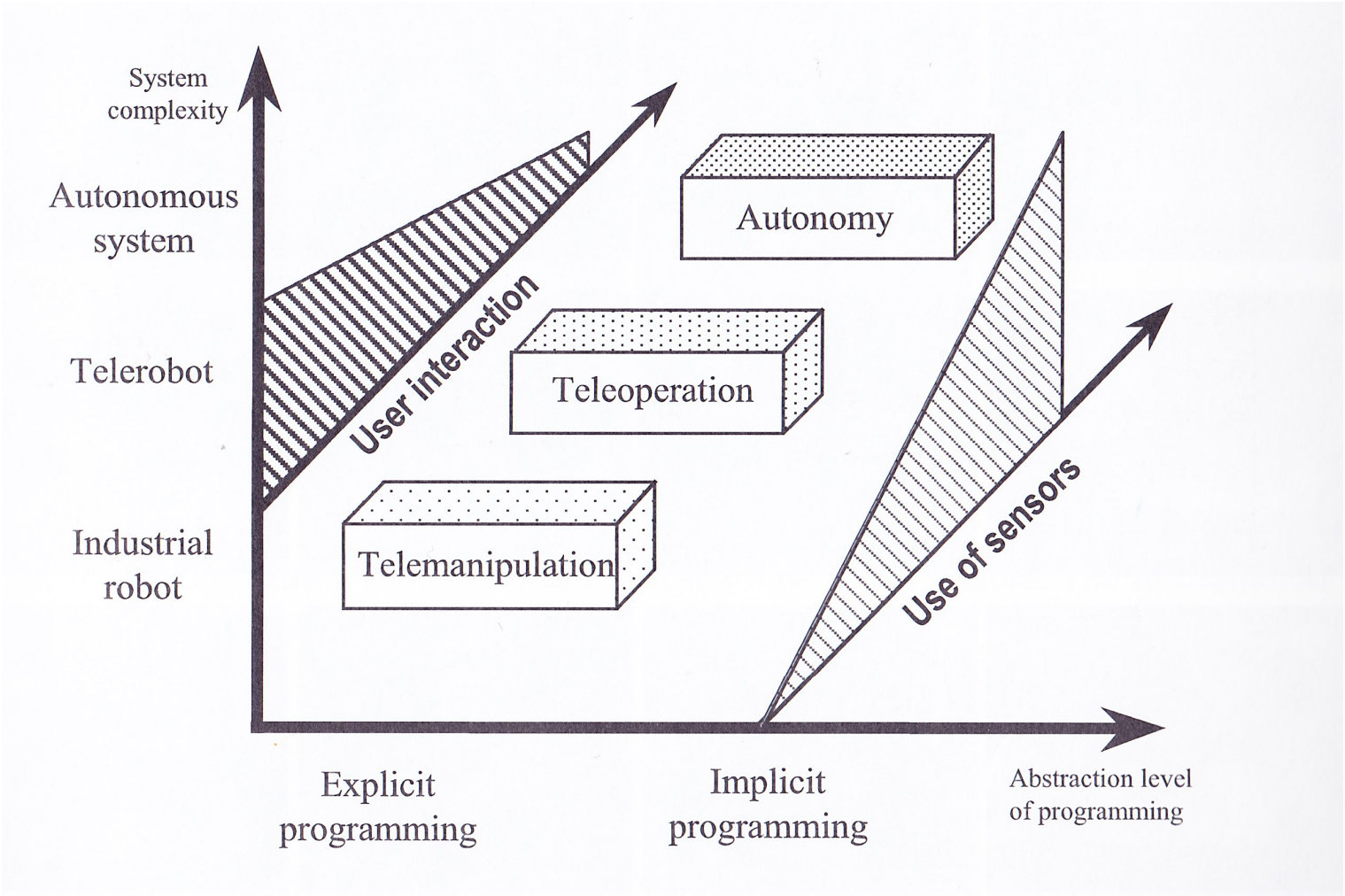
} Industry

$\Rightarrow$ Robotics = Industrial Robots

New Robotics:

- Industrial Robots highly developed
- New field of Interactive Robots
- Bringing robots to our everyday life!

Robot Classification



Telerobotics

Telerobotic System: Connect humans and robots in order to reproduce operator instructions at a distance (semi-autonomous)

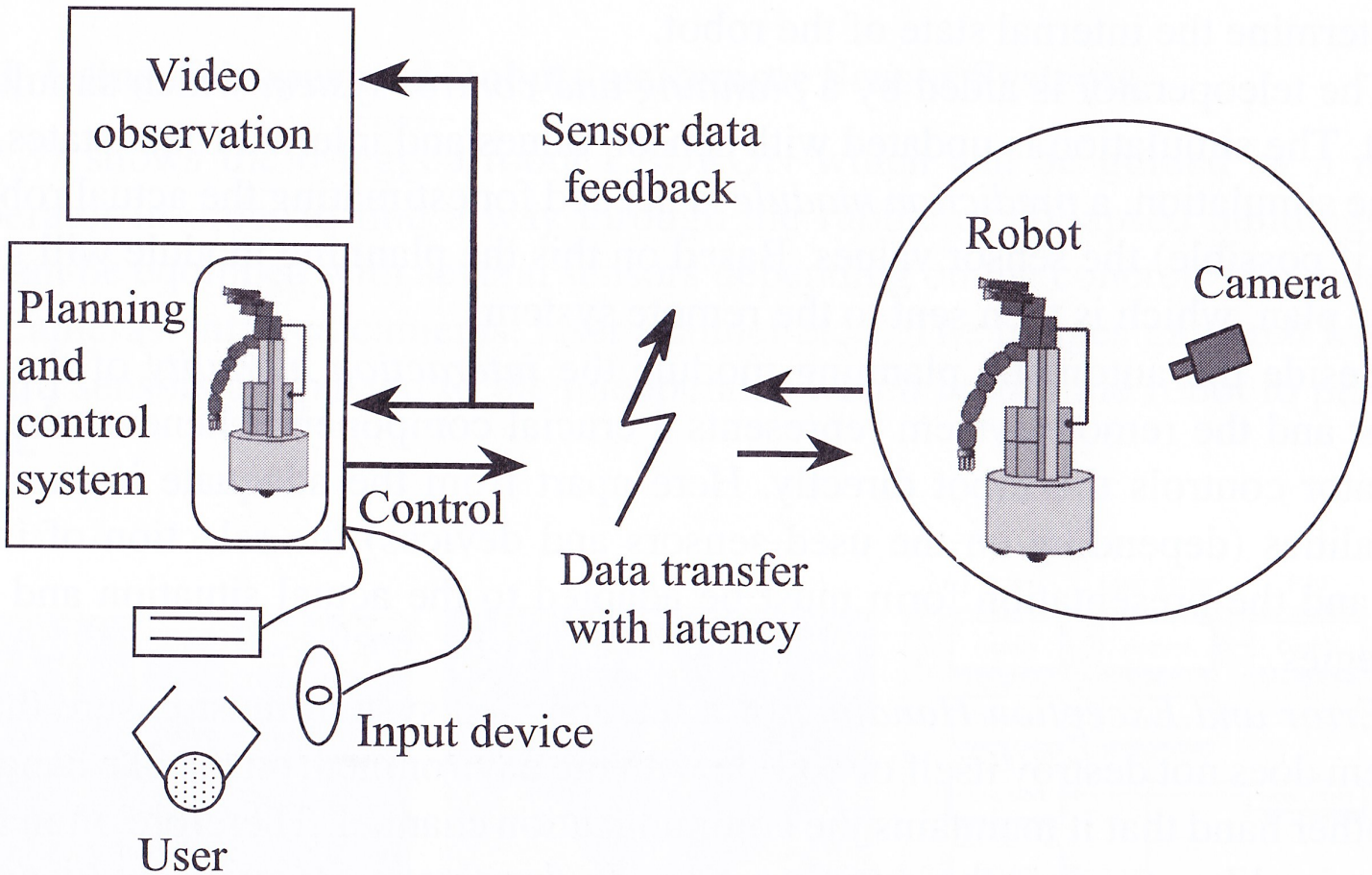
Research topics:

- Human Interface
- (Distributed) Control
- Information Flow

Applications:

- Nuclear
- Underwater
- Space

Challenges for Human-Robot Interaction



Autonomous Robotics

Autonomous System: Capable of operating in the real-world environment without any form of external control for extended period of time

Research topics:

- Robot takes care of itself
- Highlevel robot control
- Ability to adapt and learn

Applications:

- Medical Care
- Service
- Personal Assistant

Challenges for Human-Robot Interaction

Goal: Interaction for people without any programming knowledge
$\Rightarrow$ Implementing human like interaction

Desired capabilities:

- Speech
- Gesture
- Facial expressions

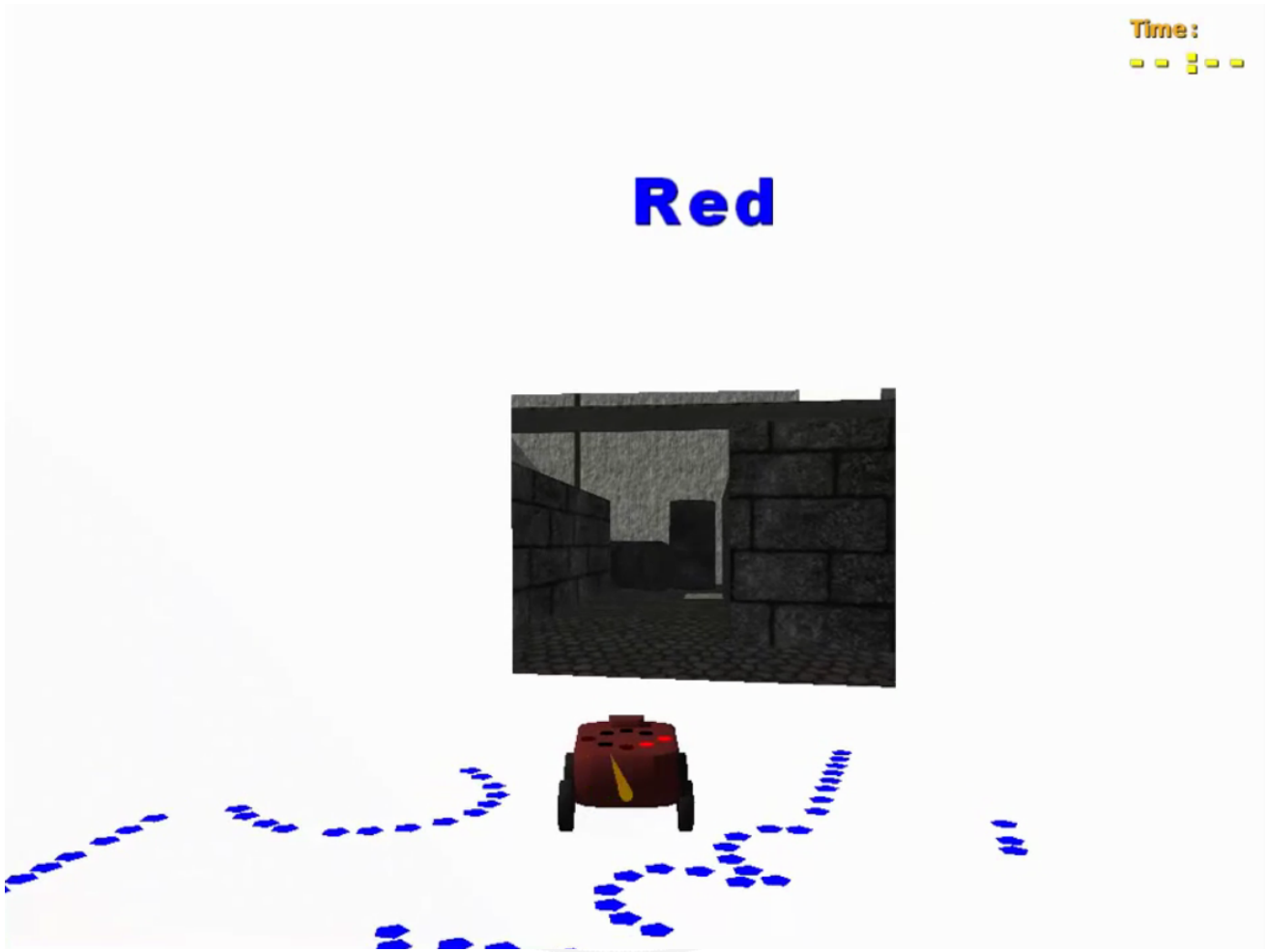
} Recognition & Generation

Correlation to appearance:
Increasing humanoid appearance leads to increasing expectations in interaction capabilities.

Outline

Motivation

Performance Effects of Multi-sensory Displays I



Performance Effects of Multi-sensory Displays II

Types of feedback:

Interface Number	Standard Visual Interface	Vibro Tactile Feedback	Audio Feedback	Visual Ring and Speedometer
1	x	x		
2	x	x	x	
3	x	x	x	x

Performance Effects of Multi-sensory Displays III

Results

- Vibro Tactile Feedback
  - Significantly improved performance
  - Subjects felt annoyed
- Audio Feedback
  - Reduction of Collisions
  - Improved performance
- Visual Ring and Speedometer
  - No significant performance improvement
  - Distracted subjects
  - Too many focus points on screen

RoboCup Rescue

Outline

Motivation

Telerobotics for Doctors

Motivate physical exercises for older Adults I

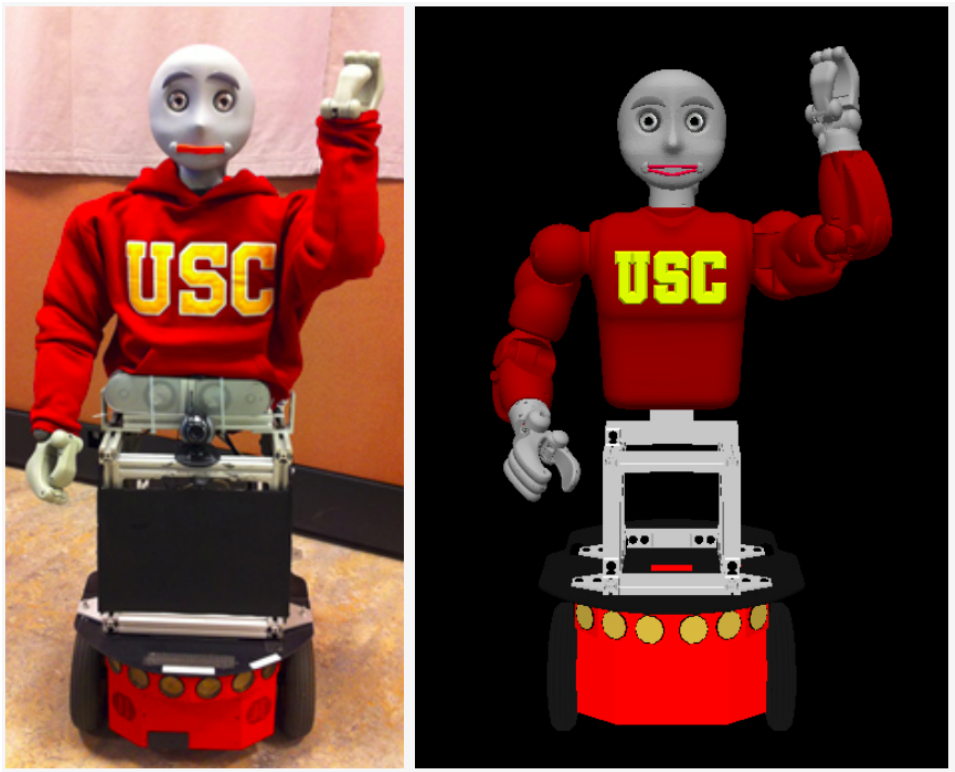
Robot task:

- Chair exercise
- Instruct, evaluate, encourage
- Target group: older adults

Motivate physical exercises for older Adults I

Two different scenarios:

1. Real physical present robot
2. Virtual robot on a screen



Motivate physical exercises for older Adults III

Results:

	Real Robot	Virtual Robot	Both equal
Enjoy More	77%	23%	0%
More Intelligent	85%	15%	0%
More Useful	85%	15%	0%
Prefer to Exercise with	85%	15%	0%
Better at Motivating	85%	15%	0%
More Frustrating	23%	77%	0%
More Entertaining	77%	15%	1%
Choice from now on	85%	15%	0%

Outline

Conclusion & Perspectives

Lessons learned:

- Robots are helpful and can save lives
- Real robots are better accepted than virtual ones
- Robots can do tasks humans can't
- There is a lot to improve until robots can join our everyday live

References


G.A. Bekey.
Autonomous Robots: From Biological Inspiration to Implementation and Control.
Intelligent robotics and autonomous agents. MIT Press, 2005.


P. G. de Barros and R. W. Lindeman.
Performance effects of multi-sensory displays in virtual teleoperation environments.
2013.


J. Fasola and M. J. Mataric.
Using socially assistive human-robot interaction to motivate physical exercise for older adults.
Proceedings of the IEEE, 100(8):2512–2526, 2012.


M. Ferre, M. Buss, R. Aracil, C. Balaguer, and C. Melchiorri.
Advances in Telerobotics.
Springer tracts in advanced robotics. Springer, 2007.


K.-F. Kraiss.
Advanced man machine interaction.
Springer, 2006.


K. Takayuki and H. Ishiguro.
Human-Robot Interaction in Social Robotics.
CRC Press, 2013.

Questions?!