WTEC International Assessment of R&D in Robotics

Toward Sensory-Motor Coordination

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Established at 1996

Faculty members (2004)

S.Arimoto  A.Ishii  T.Isaka
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Education & Research on
Mechatronics Technology
Collaboration

Education
Dept. Robotics
Dept. Micro System Technology
Dept. VLSI System Design
Dept. Human and Computer Intelligence

Research
Research Center for Robotics and Flexible Automation
Research Center for Sports and Healthcare Technology
Research Institute for MicroSystem Technology
VLSI Center
SR (Synchrotron Radiation) Center
Hirai Lab.
Laboratory for Integrated Machine Intelligence

FPGA vision
Soft-fingered manipulation
Virtual rheological object

3D imaging
Locomotion by deformation
Linear object manipulation
Card handling

Sensing
Action
Control of Soft Objects and Structures
FPGA-based Vision

Time Consuming Algorithms
- Matched Filtering
- Phase-Only Correlation
- Hough-Fourier Transform Method
- Generalized Hough Transform
- Argument Voting Method

Implementation on FPGA to reduce computation time in good cost performance

matched filtering

Radon transform
Robust Image Registration

template image

input image

occlusion

deformation

illumination change

halation
CMOS+FPGA Vision

1000fps

vision in control loop

2004-
3D Imaging by Varifocal Mirror

Entirely focused image

Distance image

2001-
Soft-fingered Manipulation

Soft-fingertip Model

Contact patterns

2002-
Embedded Force Sensor for Soft-fingered Manipulation

Micro 6-DOF force/moment sensor
Separation/Skew Control of Cards via Vacuum Hole Array

Separation of 15 cards  Skew control of card

- Card entrance
- Driving belt
- Direction of driving belt
- Card exit
- Adsorptive forces

2000-
Linear Object Manipulation

Differential geometry coordinates

Knotting/Unknotting of DLO
Crawling and Jumping of Deformable Soft Robot

charge/discharge of potential energy stored in deformable body
Simulation of Soft Objects

Particle-based model

Simulation of forming process

2000-
Toward Sensory-Motor Coordination

21st COE program Micro-Nano Science Integrated Systems

Integration of Robotics and Micro/Nano Technology