‘Toward a new era of EU-Japan cooperation in Robotics: rationale and objectives’

Masakatsu G. Fujie
1Faculty of Science and Engineering, Waseda University, Tokyo, Japan

The coming super-aged societies
Comparison of aging population (over 65-year old)

Human Support by RT
Current stagnation
- Decreasing working-age population
- Increasing Welfare Burden
- Shrinking economy
Active future
- RT-support for working people
- Social participation of elderly and disabled
- Sustainable economy

Creation of New “RT-” Industries
RT for Medical 医療
RT for Welfare 福祉
RT for Agriculture, Forestry and Fisheries 農林漁業
RT for Service サービス業
Market growth 市場の拡大
**Main Purpose of this Program**

- **Title:**
  Human-Robot-Collaboration Challenge (HRC2)
  -- Robot Technologies for Daily Life Support and Manufacturing Assistance --

- **Contents:**
  In the super-aging society, human-adapted robots are urgently required both in daily life support and in manufacturing assistance.

  × HRP Robotics, DARPA Robotics Challenge Trials (DRC), The Great East Japan Earthquake Disaster Robotics, Decommission, Daily Life Support (0.1MV) are out of scope

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**The Great East Japan Earthquake Disaster Robotics**

Such advanced requirements could be realized by developing intelligent system that supports complicated machine operations

- Adaptive hydraulic control system
- Bilateral human-machine interface
- Operational gain control system
- Advanced hardware system

**The Great East Japan Earthquake Disaster Robotics**

- Dual arm demolition machine, (Tokyu const.)
- Double-Front Construction Machinery (Hitachi const.)
Key Concept of WASEDA Robot

Robot with Human

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DARPA Robotics Challenge (Trial Tasks)

Autonomy – Perception
Autonomy – Decision-making
Mounted Mobility
Dismounted Mobility
Dexterity
Strength
Endurance

Sample Tasks

1. Drive utility vehicle (e.g. Gator, Ranger) X X X X
2. Travel dismounted 20 m through various terrains X X
3. Remove debris blocking entryway X X X X X
4. Open door, enter building X X X
5. Climb industrial ladder/stairs/walkway X X X
6. Break through wall X X X X X
7. Locate and close valve X X X X X X
8. Connect fire hose X X X X X X

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DARPA Robotics Challenge (Program Tracks)

<table>
<thead>
<tr>
<th>Track A</th>
<th>Track B</th>
<th>Track C</th>
<th>Track D</th>
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<tbody>
<tr>
<td>CY2012</td>
<td>CY2013</td>
<td>CY2014/15</td>
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<tr>
<td>System</td>
<td>Software</td>
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<tr>
<td>7 Teams</td>
<td>11 Teams</td>
<td>15 Teams</td>
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<td>$750k each</td>
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<td>≤ 8 Teams</td>
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<td>$1.2 M each</td>
<td>≤ $750k each</td>
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<tr>
<td>6 Months</td>
<td>12-18 Months</td>
<td>8 Months</td>
<td></td>
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Winners

- CDR
- VRC
- SCHAFT Inc.

[http://www.theroboticschallenge.org/]

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SCHAFT Inc.

[Weight: 95 kg]
Main Purpose of this Program

- **Human-Robot-Collaboration like Human-Human-Collaboration**
  - Achieve the Methodology

- **Commercialize, New Products**
  - Achieve the Robots

To be developed in the future

- Diversity of Human (age • gender • Skilled/unskilled and soon)
- “Fitting” autonomously in a changing environment

Currently
- People adapt to the machine
  - Paradigm shift in the relationship between machine - Human

Future
- Machine is adjusted to people
  - Without collision Safe while touched
  - Intuitive Willing to use
  - Comfortably drive

Recent Example by MEXT

Grant-in-Aid for Scientific Research(S) (Ongoing)
- Research on Human and Robot cooperation models
  - Physical and emotional interaction
  - Safety of human when working with robots

Main Purpose of this Program

- **Foundation and Formation**
  - EU: Horizon 2020?

- **Japan:**
  - METI, MEXT, MHLW or Cabinet Office
    METI: Ministry of Economy, Trade and Industry (Mr. YAJIMA)?
    MEXT: Ministry of Education, Culture, Sports, Science and Technology

Similar formation like EUREKA (1985～) and
METI(Companies: Hitachi, Toshiba, NEC, Mitsubishi electric co.) - MEXT(Universities), NASDA

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Practical realization after EUREKA

1997, 2000: On space shuttle Discovery with astronaut WAKATA

2010: ISS Japanese science module KIBO

Research for Development

- Advanced and Innovative Companies, not the traditional companies.
  - Achieve the Methodology

- Commercialize, New Products
  - Achieve the Robots

Contents of this Program

- Aim to realize robots
- Keywords:
  - Challenging Tasks: Daily life support and Manufacturing Industry assistance
  - Understanding method of Human condition
  - Learning of Communication situations and Realizing Mutual understanding
  - Dependable Robot Design (Reliable and Safety Robot Hardware)
  - and Contact Control Strategy between Human and Robots
  - Human-centered Manufacturing
  - Automation Cell with Robots
  - Evaluation methodology for Human-Robot-Collaboration

Thanks for your attention!
Contact: mgfujie@waseda.jp
海外派遣事業：日本から世界へ
若手の「国際的突破力」をさらに開花・発揮させる

例：ポドク（28歳）
- 博士号取得直後にフランスへ、
  半年間の滞在研究活動
  先端医療ロボットの共同研究
  欧州7研究機関との
  新プロジェクト作成を主導

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