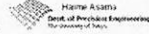
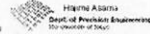


### Introduction of Robot Technology for the Great Eastern Japan Earthquake and the Accident of Fukushima Daiichi Nuclear Power Plant

Hajime ASAMA  
School of Engineering, The University of Tokyo, Japan  
Robotics Task Force for Anti-Disaster, Chairman  
Remote Control/Robotics Project Team, Member



I extend my sincere condolences  
for all the victims, and  
express my hearty sympathy with  
all the evacuees  
due to the Earthquake



### The East Japan Earthquake and the Tsunami

#### Earthquake

- 14:46, Mar 11, 2011
- Magnitude: M9.0
- Maximum Seismic Intensity Scale: 7

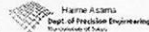


#### Tsunami

- 30 min later
- Maximum Wave Height: 23[m]



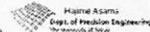
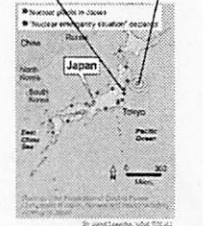
FYI Hanshin-Awaji Earthquake  
M7.3  
Dead and Missing: 6437



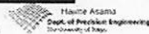
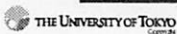
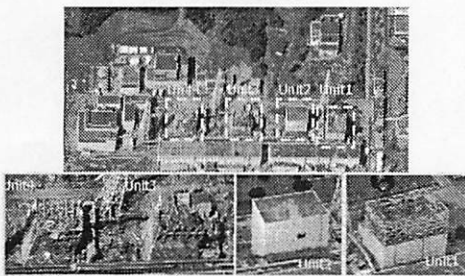
### Accident of Fukushima Daiichi Nuclear Power Plant

- Earthquake (14:47)
- Loss of Power Supply
- Activation of Emergency Diesel Generator
- SCRAM
  - Stop Reactors
- Tsunami
- Damage of Fuel Tanks and Generators
- SBO (Situation of Black Out) (15:39)
- Failure of Cooling System of Reactors and Fuel Storage Pool
- Loss of Cooling Water
- Hydrogen Explosion (May 12-14, Unit 1, 3, 4)

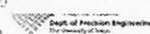
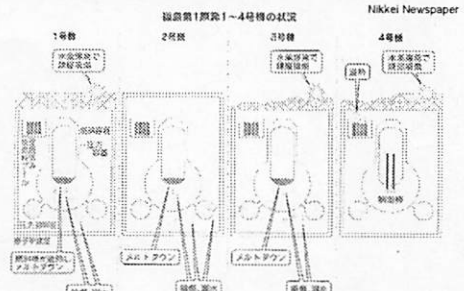
Fukushima Daiichi Nuclear Power Plant  
Seismic Center



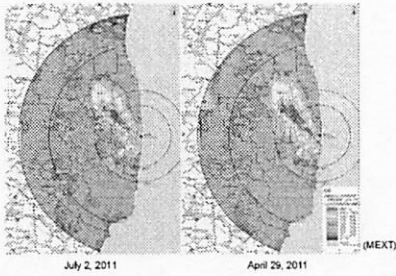
### Current Situation



### Current situation of units



## Radiation level



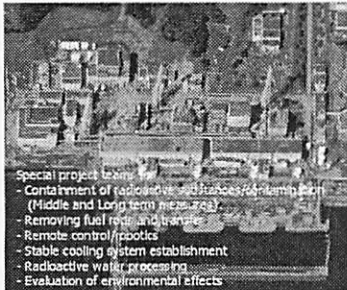
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Hajime Asama  
Dept. of Precision Engineering  
The University of Tokyo

## Needs for Robots

- For Operation in Nuclear Power Plants
  - Missions
    - Stabilization of the cooling systems
    - Containment (Coverage of Reactor Buildings)
    - Decommission (Extraction of Nuclear Fuels)
    - Reduction of radiation exposure of workers
  - Tasks
    - Debris cleaning
    - Surveillance and mapping outside and inside of the buildings (images, radiation, temperature, humidity, oxygen concentration, etc.)
    - Shield and decontamination, etc.
- For Other Disaster Response
  - Victim search and rescue
  - Inspection, diagnosis and recovery of plants and facilities
  - Surveillance of coast underwater
  - Mapping of the damaged area
  - Power assist for heavy load tasks
  - Mental care of evacuees

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## Special Project Teams (Japanese Gov. and TEPCO)



- Special project teams
- Containment of radioactive substances (Middle and Long term measures)
  - Removing fuel rods and transfer
  - Remote control/robotics
  - Stable cooling system establishment
  - Radioactive water processing
  - Evaluation of environmental effects

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## ROBOTAD

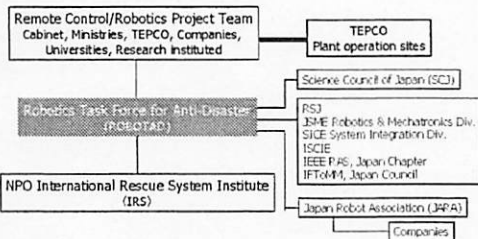
ROBOTics Task force for Anti-Disaster  
(ROBOTics - Temporary Active Duty)  
<http://roboticstaskforce.wordpress.com/>

Anchorman: Yoshihiko Nakamura  
Chairman: Hajime Asama

- Established on Mar 31, 2011
- Group of scientists and engineers on robotics
- Objective:
  - Propose and introduce solutions for the disaster response and measures by applying robot technologies
- Main activities: (Quick action required)
  - Assist remote control/robotics PT
  - Propose and introduce solutions for the disaster response and measures by applying robot technologies
  - Support technically in mobilization and operation of robot systems including modification and reinforcement
  - Maintenance of database on applicable robot technology and achievement records
  - Broadcast technical information
- Association
  - RSJ, JOME Robotics Div., SICE SI Div., IEEE P-AS Japan Chap., IFToMM Japan Council
  - Science Council of Japan
  - Japan Robot Association and companies
  - IRS (IFO, International Rescue System Institute)

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## Structure of ROBOTAD



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## Automated watering by concrete pumping truck

From Mar. 22



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