

How to conduct field experiments with service robots in urban settings?



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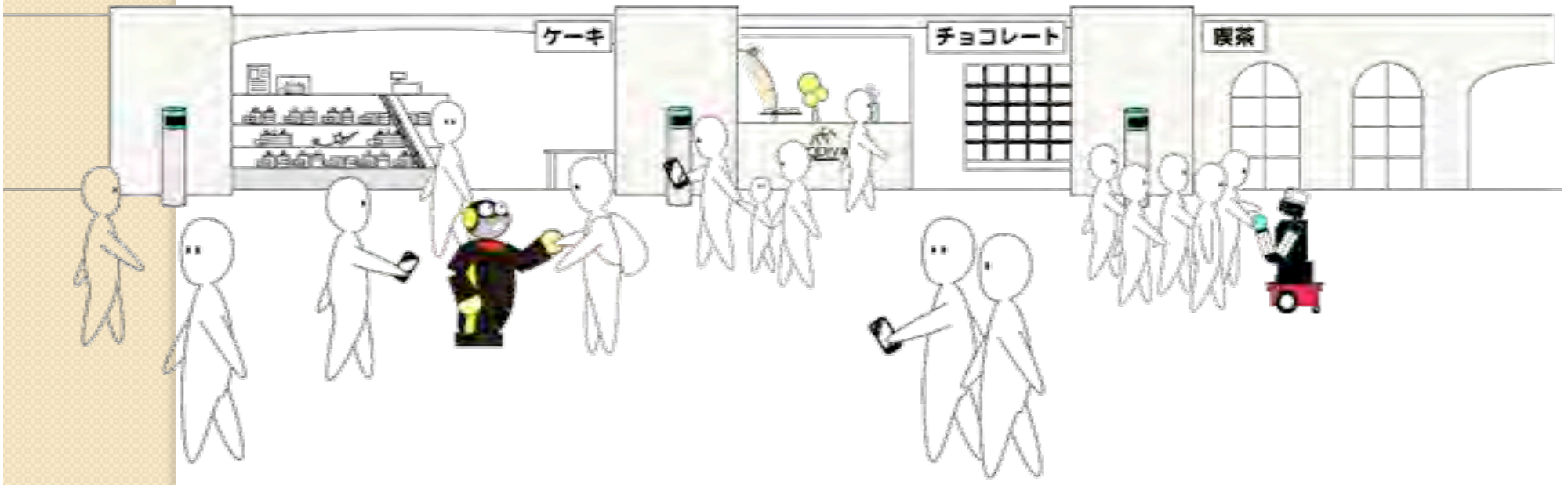
ATR Intelligent Robotics and Communication Labs.

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Advanced Telecommunications
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Introduction

- Field experiments are indispensable for research and development of service robots.
- There are many points to notice for conducting the field experiments.
- This talk introduce the points, solutions and the method for conducting safety field experiments.



Field Experiments

- We've conducted many field experiments in many kinds of environments.
 - Shopping center, shopping mall,
 - Train station,
 - Science museum,
 - Elementary school,
 - etc...



Field Experiments in Science Museum and Shopping Mall



Science Museum
(Osaka Science Museum, JAPAN)
2004




Shopping Mall
(Universal City Walk Osaka, JAPAN)
2008



Contents

- Introduction
- Example of Field Experiment
- Procedure for Field Experiment
 - Points to notice for each STEP
 - Result of the constructing Experiment Environments
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Procedure for Field Experiments

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- Selection of environment
 - Liability insurance for Robots and Sensors
 - Design of Exterior for Robots and Sensors
 - Setup for Systems
 - Carrying Robots and Sensors in
 - Construction of the system
 - Points to notice in the exp.
 - Carrying Robots and Sensors out
 - Withdrawal of the system

Selection of Environment

- First of all, we should consider suitable place for the experiments.
- ex. Universal City Walk Osaka



Universal CityWalk Osaka™ and Universal Studios Japan™ Universal Studios.

- Problem:
There is no immediate benefit for the mall.
- Solution:
Let's make a immediate benefit when you negotiate with the mall.

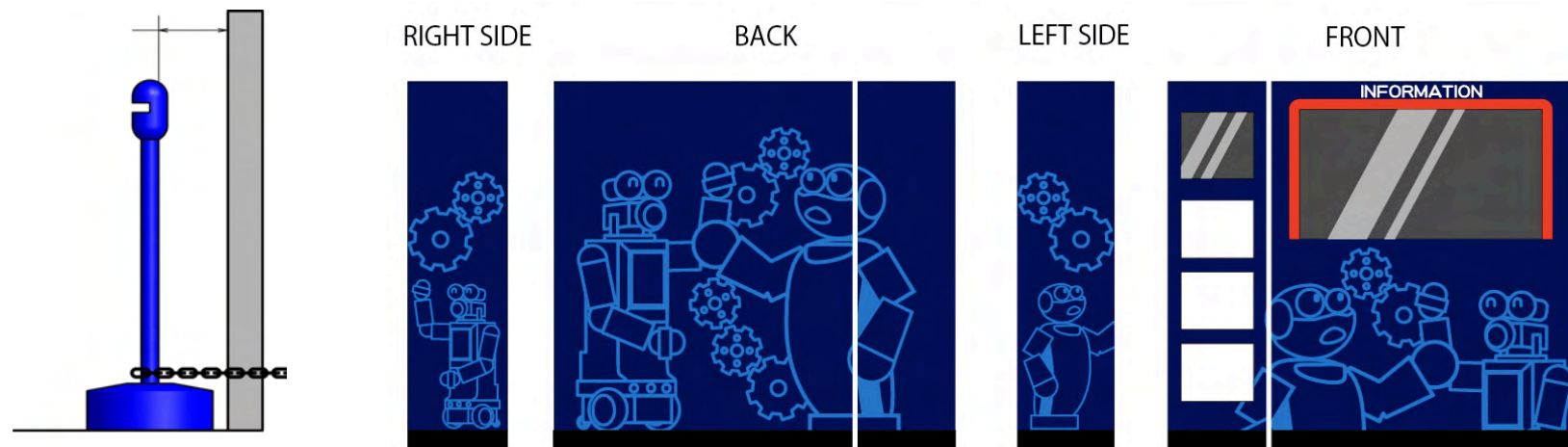


Insurance for Robots and Sensors

- Second, we should decrease risks of the robots by considering plans for safety suitable for the environment.
- → We should buy Liability Insurance for our Robots and Sensors.

Design of Exterior for Robots and Sensors

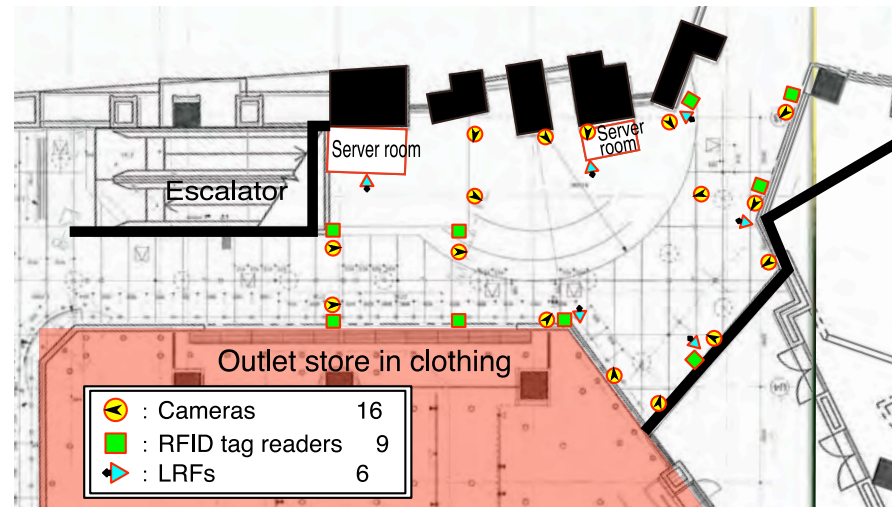
- Third, we should consider design of exterior for robots, sensors and all other devices used in the experiments.



- Problems: Some shopping mall has its official color and design rules. And also there are general rules such as the fire laws.
- Solution: Early negotiation is effective. Easiest way is to order such design to the official designer.

Setup for Systems

- Fourth, we should estimate the area and the electric power to prepare construction of the environment.



- Problem: There are other shops in shopping mall and, of course, we must not obstruct their business.

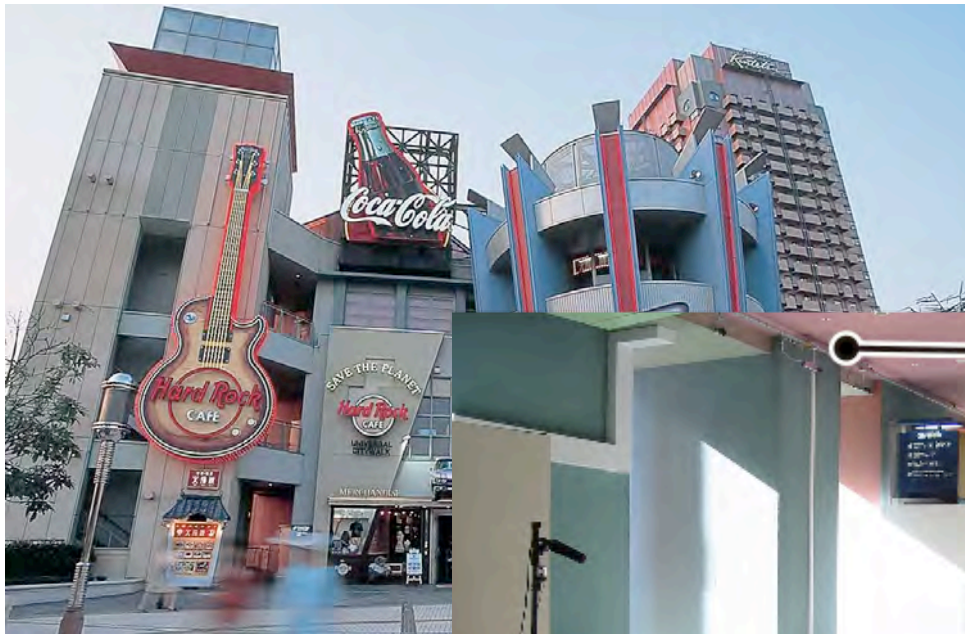


Construction of the system

- The contents of the construction are mainly the increase in power supply capacity, construct hardwired network for sensors and PCs, and installation of the basement of sensors.
- There are some rules for the construction.
- ex.
 - Time for construction must be midnight or early morning.
 - For outdoor or semi-outdoor environment, the material of the attachment must be water-proof and fire-proof.

Environmental information server for Service Robots I

- in Universal City Walk Osaka



天井に設置したカメラ (一部)



レーザ・レンジ・ファインダ (一部)

Environmental information server for Service Robots I

- in Universal City Walk Osaka



Environmental information server for Service Robots I

- in Universal City Walk Osaka





Points to notice in Experiments

- Work before experiments:
 - Ethical review for ensuring participant's privacy and safety.
- Works while conducting experiments:
 - Making posters to announce experiment area (and to prevent the sensor stand becoming an ashtray or a garbage box)
 - Keeping a width of a passage 1.6 m (fire law)
 - Periodical cleaning of an installation object.
 - Adjustment of volume of the robot (measure against a complaint to a neighboring area)
 - Keeping delightful appearance of the environment when not experimenting (electricity is switched off by a timer at closed time of shopping mall)
 - The staff stands and it serves (staff jumper etc.).



Carrying Robots and Sensors out and Withdrawal of the system

- We should re-construct and return the experiment environment to the environment before the experiment.

Environmental information server for Service Robots II

- in Asia and Pacific Trade Center (ATC)





Conclusion

- In the talk, an example of procedure of the field experiment for service robot was introduced.
- We should consider regulations for service robots.
- There are, however, some local rules and regulations in the real environment such as shopping mall, train station, etc.
- We should also consider such local rules and negotiate with the managements of the environments to conduct the safety field experiments.

Thank you for your attention!
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