Session 5: Panel Answers

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1. Where and how are robots tested?

[Where]

- Most frequently: the developer's site. Big companies have the resources to do this properly. Small companies can find this difficult.
- Next: the user's site. The user's knowledge of robot can be limited so the validity of the site can be unclear.
- If very suitable/cost effective/required: public site (e.g., for certification)

[How]

- For scenario test, the result varies depending on the test developers.
- For technical specifications, on engineering and standards (mostly durability, e.g., MIL-STD-810)

2. Where and how are robot operators trained?

[Where]

- Similar to the case for robot testing.
- More training in the user's site.

[How]

- Similar to the case for robot testing.
- A competition could be used to motivate the training if more robots are used.

3. How can these testing and training programs be incorporated into a certification program recognized by industry and government?

[basic]

- the necessity of certification should be recognized by industry and government.
- The necessity could be explained from the view point of social effectiveness, e.g.: scenario and moc-up based test/ training are solid but less generally applicable. Certification based on standards clarifies basic performance and is more generally applicable.

[substantial measure]

- Concrete examples should be used to convey the concept.
- Consensus standards are developed across communities – robot developers, robot users, standards developers.

4. How do industry-developed standards (e.g., ASTM International, American Society of Mechanical Engineers) gain regulatory acceptance?

- Explain the necessity of the standards
  - Especially for mid- and long term cost-effectiveness and innovation promotion.
- Explain the validity of the standards
  - Really “standard?”. They should be free of industry bias.
  - Reproducibility and repeatability with solid evidence.
- Explain the workability of the standards
  - Cost, place, human resource, …
- Explain the maintainability of the standards.

5. What are the procedural and regulatory challenges that need to be addressed?

Accountability after an accident.

- Suppose: Class-A robot with Class-A operator has trouble and cause an accident. Who should be blamed? The robot developer? The operator? The boss of the operator?
  The certification organization? The regulatory authority?"
- Existing big industry has a system for the accountability
  (e.g., National Transportation Safety Board in US with related standards).
- For the accountability after an accident, all information should be clear and transparent, but in some situations, the information is not fully opened and biased, e.g. medical accident.
- A well-examined system for the accountability is needed, or an accident collapse the system.

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