

IEEE ICRA 2009 Workshop on Legal and Safety Issues Regarding Service Robots Operating in Urban Environments

Toward the Human-Robot Co-Existence Society:
On Legislative Consortium for Social Robotics

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Outline

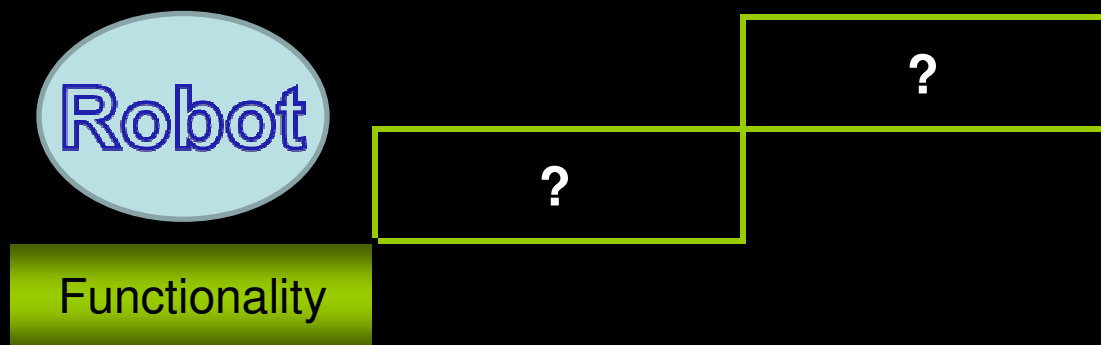
- Part 1:
 - *Robot Sociability Problems*
- Part 2:
 - *Principle of Reserved Core Values*
- Part 3:
 - *Legislative Consortium for Social Robotics*

Part 1

Robot Sociability Problems

Three Stages for Entering the Human Society

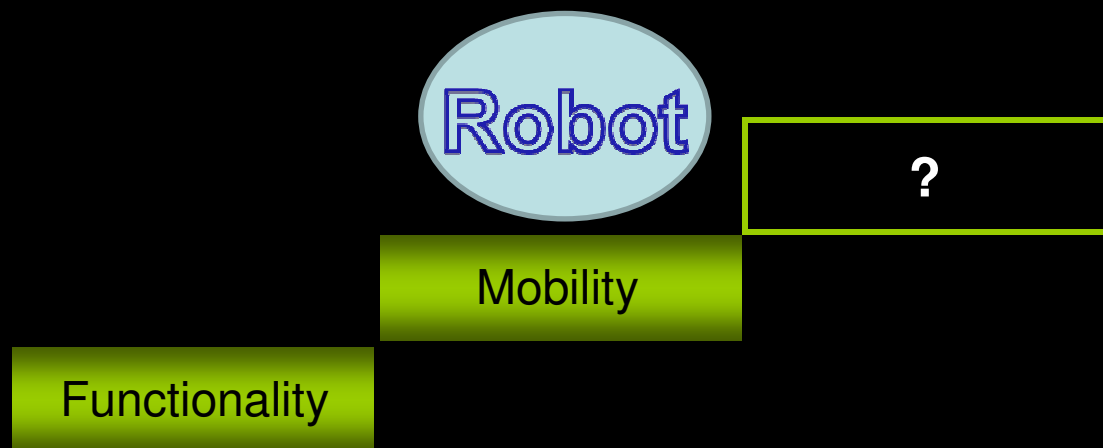
- Early Stage: **Functionality**
 - For “3D” (Dull, Dangerous & Dirty) duties
 - Be isolated from human beings



http://www.kobelco.co.jp/welding/system/robot/1173778_1898.html

Three Stages for Entering the Human Society

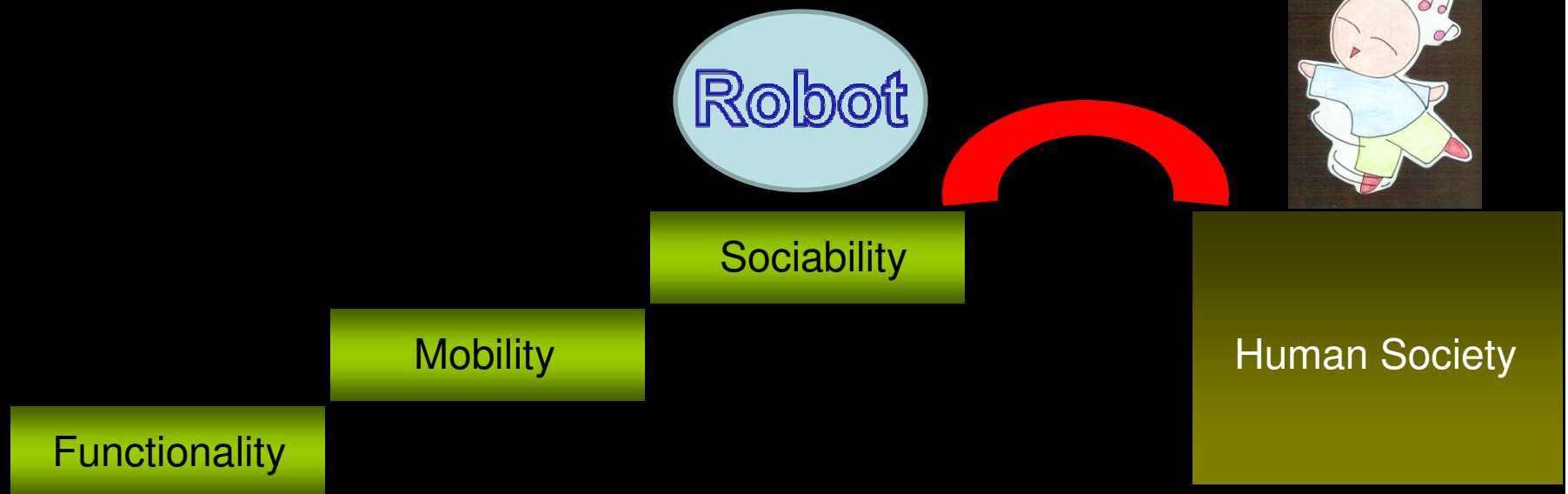
- Middle Stage: **Mobility**
 - The ability to access the unstructured environment
 - The possibility for supporting human life



[http://www.darpa.mil/gandchallenge04 & 05](http://www.darpa.mil/gandchallenge04&05)

Three Stages for Entering the Human Society

- Final Stage: **Sociability**
 - Satisfy humans' needs and co-exist with human beings on the premise of *Human-Robot Co-Existence Society*



Robot Sociability

- **Sociability:** The skill, tendency or property of being sociable or social, of interacting well with others (from <http://www.wiktionary.org/>)
- Designing Robot Sociability can be divided into:
 - ***Human-Robot Interaction*** (Technical Centered)
 - ***Social System Design*** (Legal Centered)

The Fukuoka World Robot Declaration (2004)

- *a) next generation robots will be partners that coexist with human beings*
- *b) next generation robots will assist human beings both physically and psychologically*
- *c) next-generation robots will contribute to the realization of a safe and peaceful society*

- **How to implement the content of *FWRD* is strongly related to *Robot Sociability***

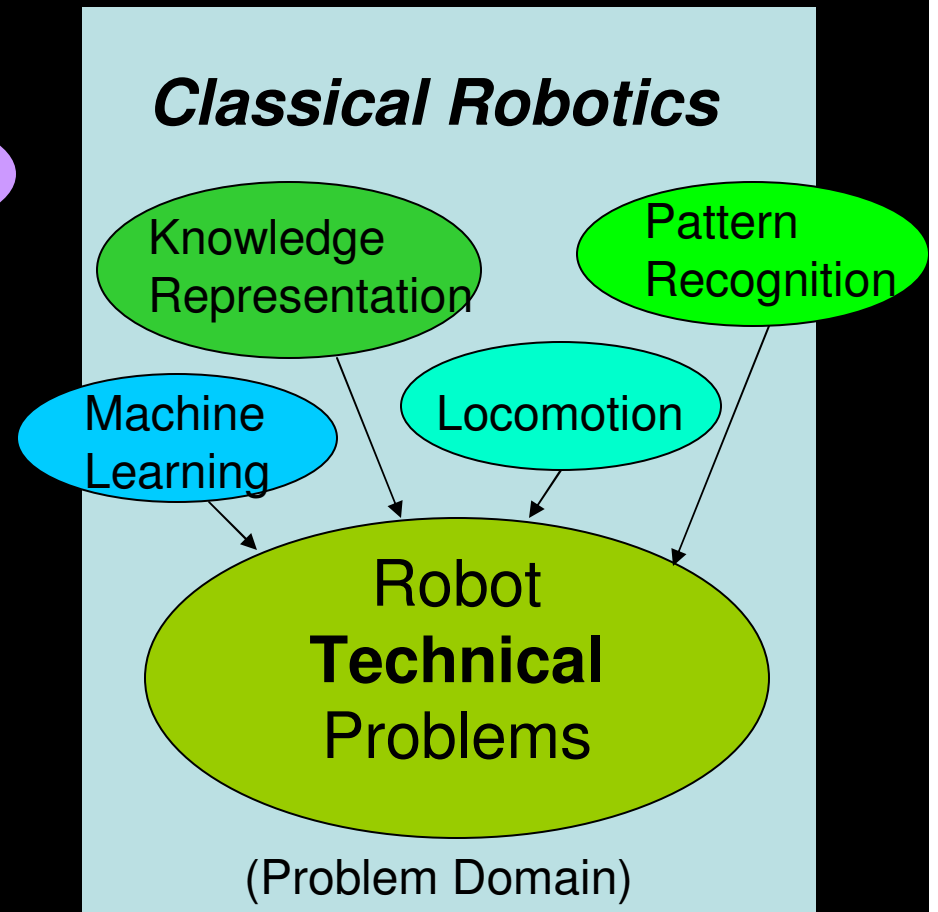
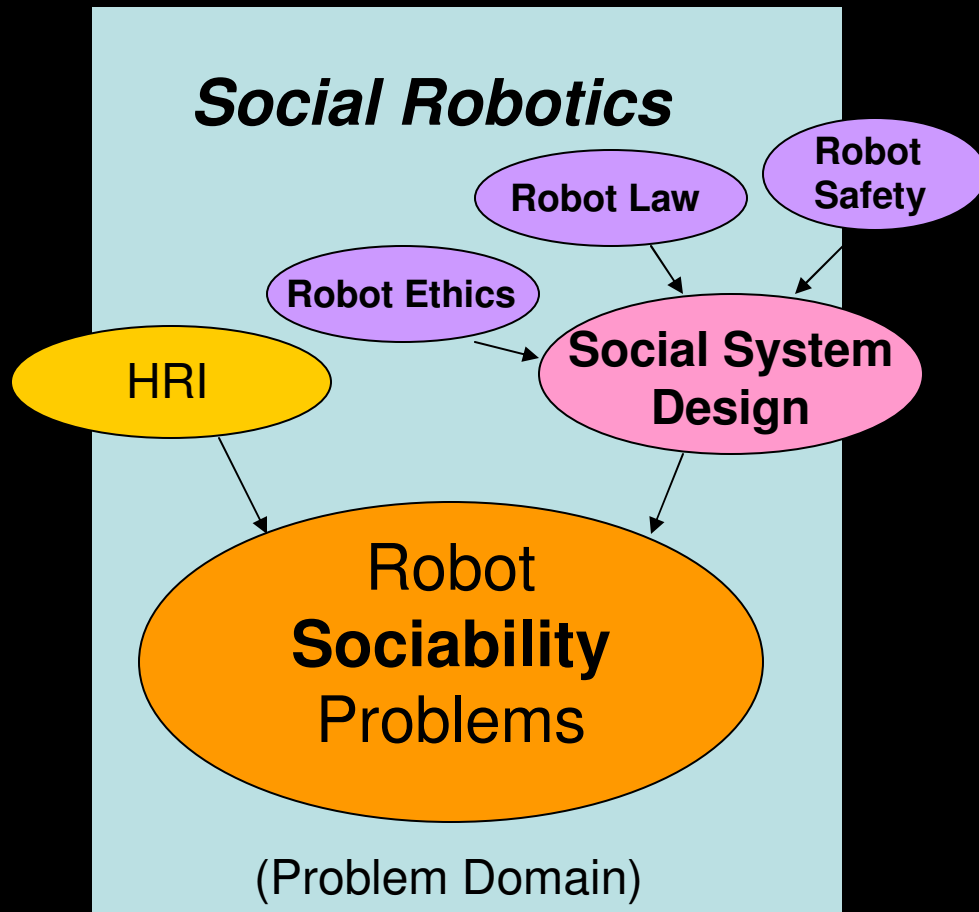
A Robot in Every Home ?

- It's not necessarily promising an outcome for *"A Robot in Every Home"* as Bill Gates believes
- There's a *"Robot Apollo Mission"* waiting for us in the following decades (T. Sato 2009, TimesOnline)
- It depended on our attitudes for dealing with *Robot Sociability Problems* (Y.H. Weng, C.H. Chen & C.T. Sun 2007, ICAIL-Stanford)

Robot Sociability Problems

- Social robotics is related to a series of interdisciplinary issues and challenges including: **Architecture, Urban planning, Education, Energy, Ethics, Law etc...**
- These issues could be called ***Robot Sociability Problems***
- ***Human-Robot Interaction & Social System Design*** will be the **KEY** solving interdisciplinary problems

Social Robotics VS. Classical Robotics



Summary of Part 1

(a) What is Robot Sociability?

(b) How is it related to the Human-Robot Co-Exist?

(c) How can we address this emerging issue?

Part 2

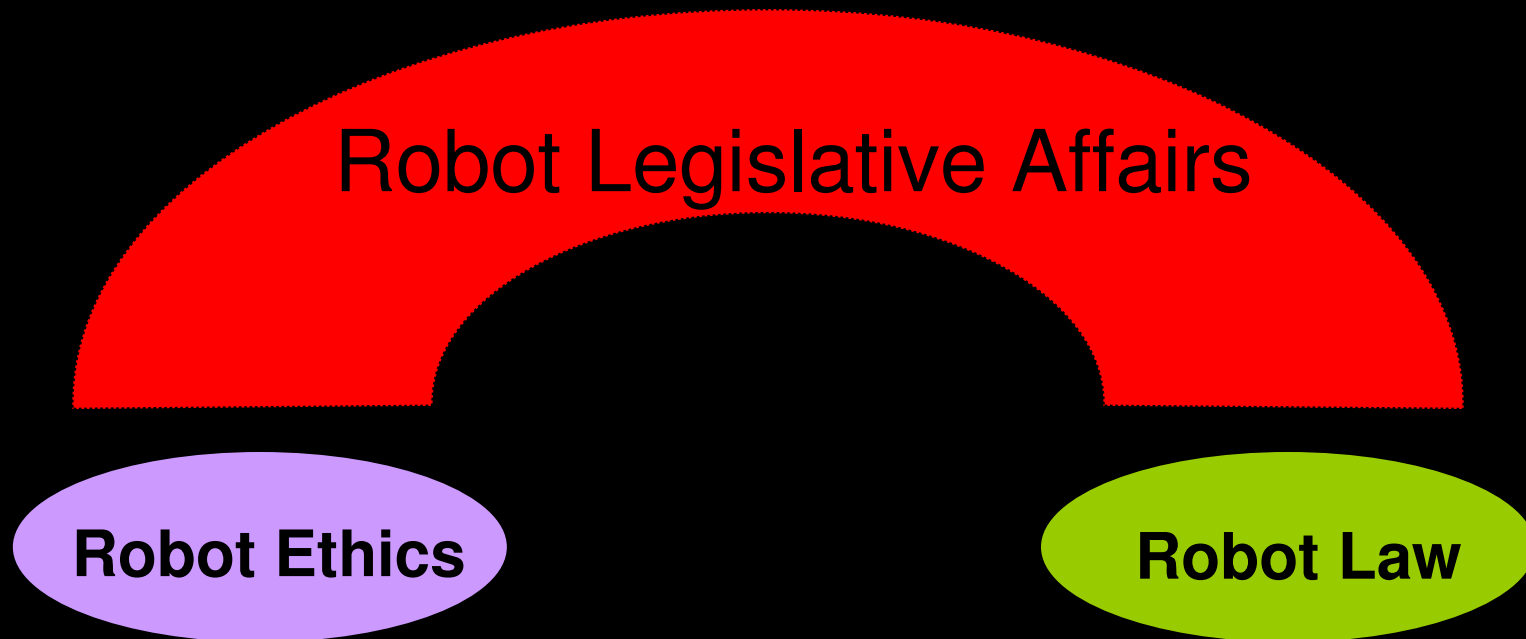
Principle of Reserved Core Values

Robot Ethics & Law

- Robot Ethics (**Understanding** from an **Ideal World**)
 - **Understanding** the relationship between Humans & Robots
- Robot Law (**Defining** in the **Real World**)
 - **Defining** the relationship between Humans & Robots

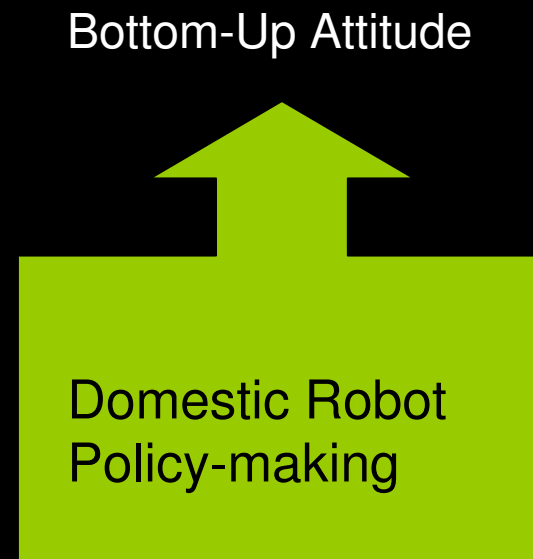
Robot Legislative Affairs

- **Robot Legislative Affairs** - A bridge between the **Ideal** and **Real** Worlds



Robot Legislative Affairs

- There are two models for Robot Legislative Affairs, such as *International Robot Standardization* (Top-Down) & *Domestic Robot Policy-making* (Bottom-Up)



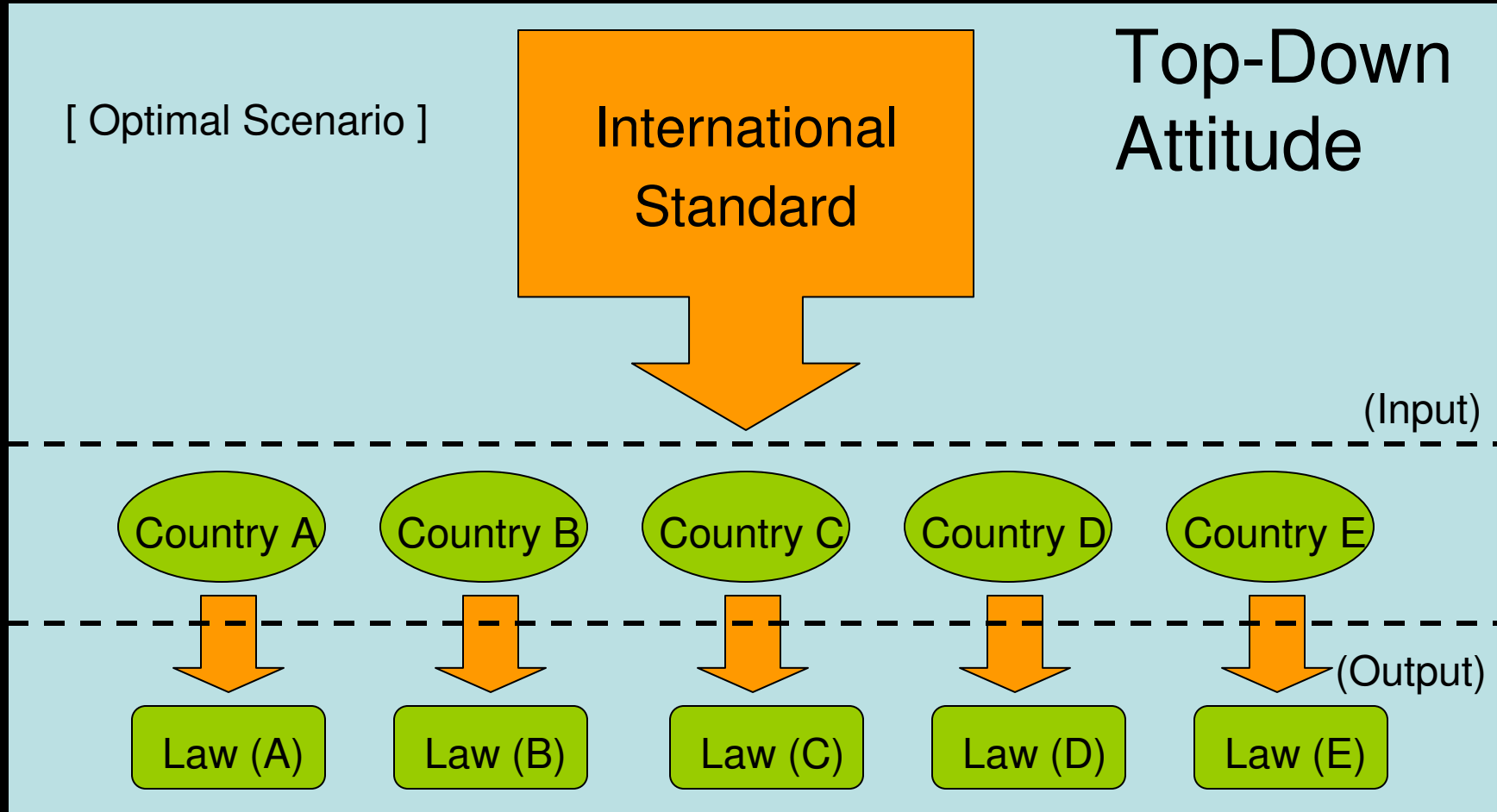
International Robot Standardization model

- **Top-Down attitude:**
 - One institute makes a standard for adoption by several countries
- **EURON:** Roboethics Roadmap (Robot Ethics)
- **ISO:** ISO10218-1 standard (Robot Safety)

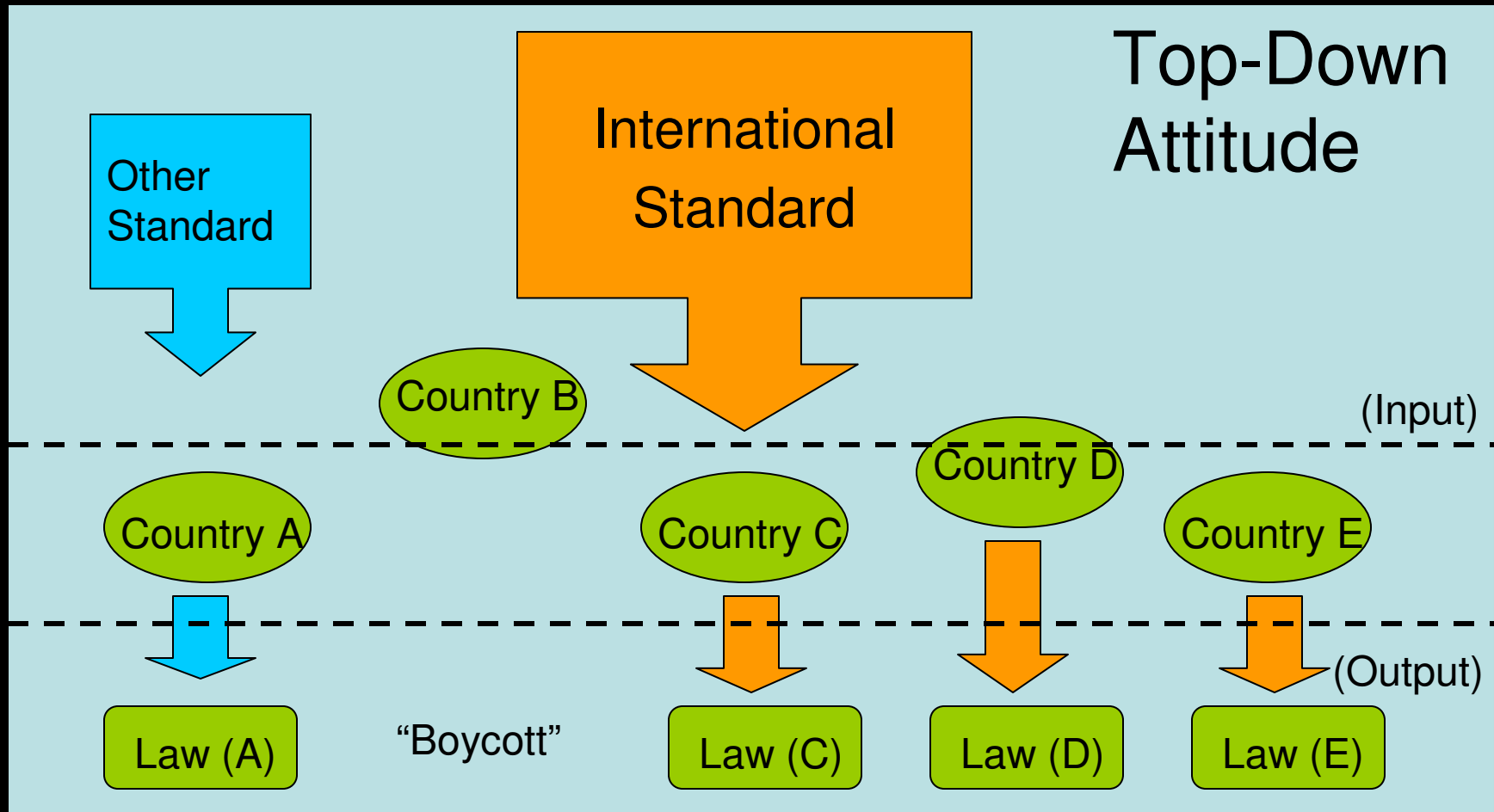
International Robot Standardization model

- Benefits:
 - Consistency for legal contents
- Shortcomings:
 - Lacks actual power
 - Does not satisfy individual demand

International Robot Standardization model



Shortcomings for International Robot Standardization model



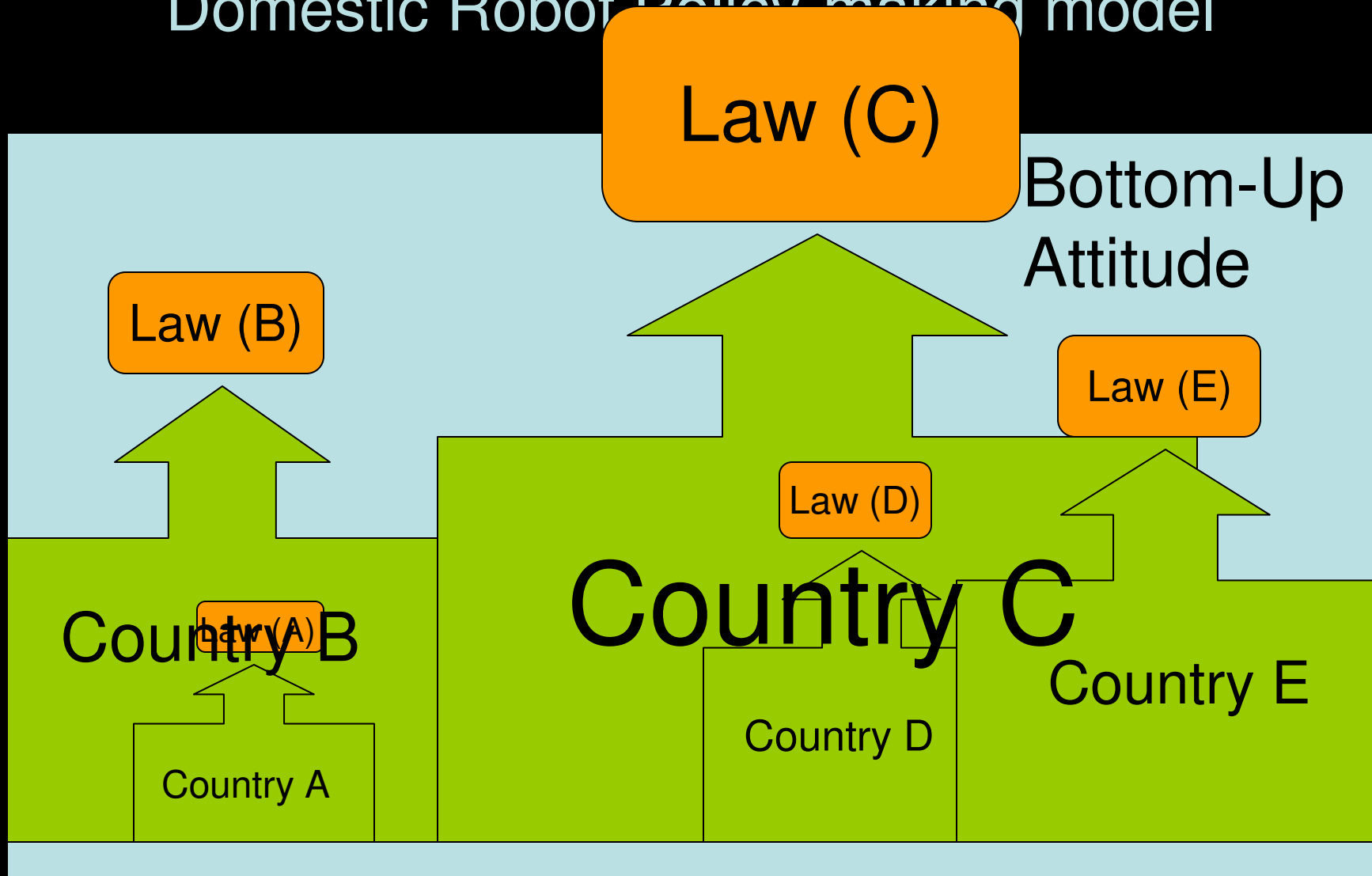
Domestic Robot Policy-making model

- **Bottom-Up attitude:**
 - Each countries develops its domestic policy & law independently
- **Japan:** METI Robot Policy series
- **USA:** DoD Policy for Building Ethical Robot Soldiers

Domestic Robot Policy-making model

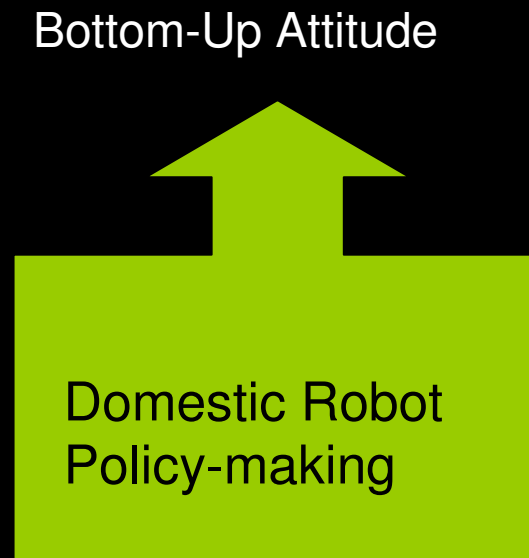
- Benefits:
 - Efficiency
- Shortcomings:
 - Conflicts may occur easily
 - *“Colonization of Robot Legislative Affairs”*

Domestic Robot Policy making model



The Two Attitudes....

- The two attitudes both have benefits and shortcomings, therefore it is possible for the legislators to refer to both models in order to apply them to a suitable problem domain.



The Legal Crisis!!

- However, there is a legal crisis, due to a special problem domain which cannot be solved properly by either attitude/strategy.
- It is the legal crisis of “**Core Value Issues of Robot Sociability**”

Core Value Issues of Robot Sociability

- Social robotics is concerned with fundamental human values – *Core Value Issues*
- **Ex.** What is the appropriate distance between humans and robots?
- **Ex.** Is it allowable for a humanoid robot to be a sexual partner with a human?
- **Ex.** Could robots be allowed to kill people under some specified conditions?

Core Value Issues of Robot Sociability

- These core value issues are **Open Questions** and **Open-Texture**
- **Q. Is it allowed for a humanoid robot to be a sexual partner with human?**
 - Yes or No? => **Open Questions**
 - Definition of a “Sexual Partner” => **Open-Texture**
- Due to these two characteristics, the issues are very difficult to define clearly, and complicates the regulation and supervision of these issues

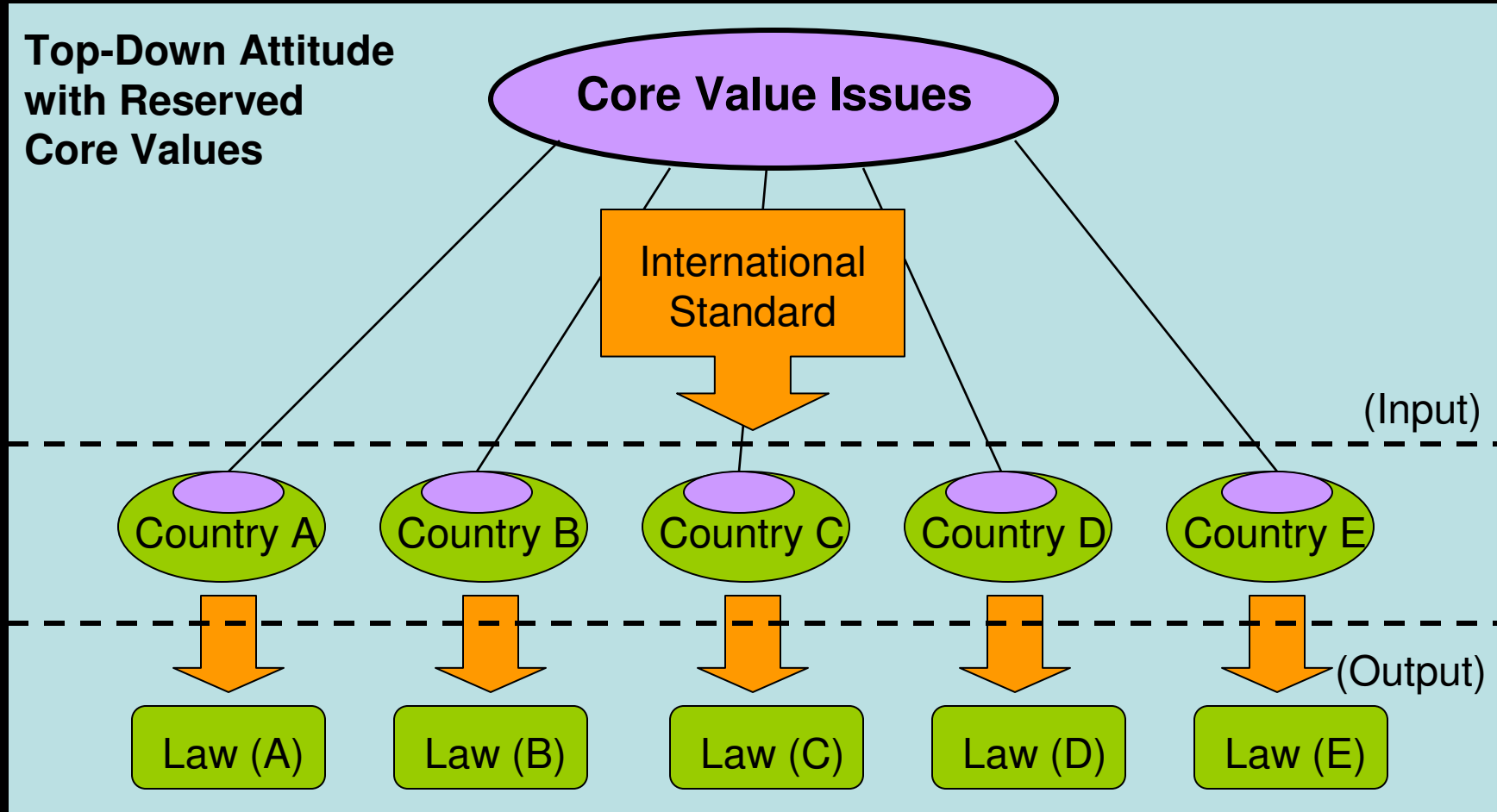
The Legal Crisis!!

- The two legislative attitudes both have potential risks when related to *Core Value Issues*
- Top-Down attitude:
 - Risk of **Rejection** or **Boycotts**.
- Bottom-Up attitude:
 - Risk of **Inconsistencies**.

Principle of Reserved Core Values

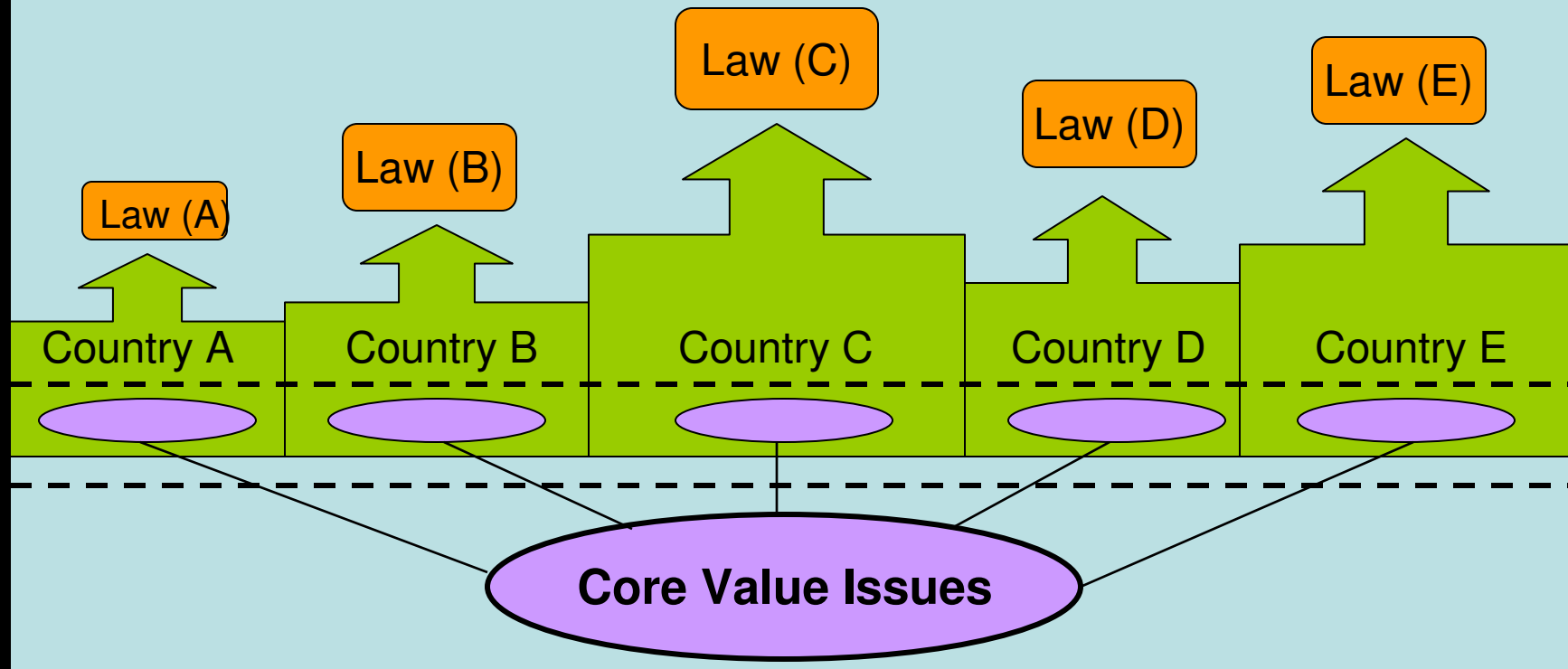
- The comprised strategy called the ***“Principle of Reserved Core Values”***
- Holding the **Supreme Position** under the range of ***Core Value Issues of Robot Sociability***
- The ***Constitutional Law*** is also a Reserved Core Value infrastructure for domestic legal systems

A Composite Model – Top-Down Attitude with Reserved Core Values



A Composite Model – Bottom-Up Attitude with Reserved Core Values

Bottom-Up Attitude
with Reserved Core Values



Practicing the Principle of Reserved Core Values

- Global Robot Sociability Legislative issues also require a platform above international countries to perform for Reserved Core Values Tasks.
- There is a demand for an independent institution to enforce the ethical, political and legislative tasks of Robot Sociability or so called **Social Robotics**

Summary of Part 2

(a) What is the importance of Robot Legislative Affairs?

(b) What are the differences between Top-Down and Bottom-Up legislative attitudes?

(c) What is the Principle of Reserved Core Values ?

Part 3

Legislative Consortium for Social Robotics

LCSR

Legislative Consortium for Social Robotics

- An international interdisciplinary platform for addressing robot sociability issues that may affect the anticipated human-robot co-existence society.

The Problem Domain – LCSR's mission in the early stage

- Do we need an idea such as Asimov's Three Laws of Robotics to guide our efforts to establish safety in human-robot interactions?
- How will we define safety intelligence for social robots?
- What constitutes proper "distance" between social robots and humans, and how can such distance be maintained?
- What features should a legal machine language have to ensure that robots adhere to human legal norms created in the name of both human and robot safety?
- What special guidelines are required for the regulation of special categories such as military robots?
- Can we predict future legal issues that will arise as social robots evolve and become increasingly sophisticated?

The Problem Domain – LCSR's mission in the early stage

- **Type1:** New Safety Design Viewpoint
- **Type2:** Human-Robot Relationships
- **Type3:** International Cooperation
- **Type4:** Robots & War

Who will benefit?



Legislative Consortium for Social Robotics

Who will benefit?



Robotics Scholars & Experts

Legislative Consortium for Social Robotics

Who will benefit?

Global Robotics Industries

Robotics Scholars & Experts



Legislative Consortium for Social Robotics

Who will benefit?



Millions of families

Global Robotics Industries

Robotics Scholars & Experts



Legislative Consortium for Social Robotics

The First Step

- (a) design the platform for sharing information and making recommendations, and
- (b) establish a list of robot sociability core value issues to be addressed.
- The most important short-term goals will be to create consensus among all parties and to create rules that robotics manufacturers can actually work with when programming their products.

Evaluation

- **Level A+:** Successful establishment of a comprehensive set of guidelines for a human-robot co-existence society that emphasizes human and robot safety.
- **Level A:** A complete set of recommendations for a body of laws for regulating social robots and human-robot relationships that policy makers and governments can use for enactment.
- **Level B:** Simple consultation to the social robot industry for creating guidelines to support the growth of domestic and global robotics markets.
- **Level C:** Establishing a consensus for recommendations among scholars and experts from multiple robotics-related fields.
- **Level D:** Simple establishment of an Legislative Consortium for Social Robotics body.

Summary of Part 3

- (a) What is the Legislative Consortium for Social Robotics (LCSR)?
- (b) What is LCSR's problem domain?
- (c) Who benefits from LCSR?

Conclusion

- LCSR as an platform across Robotics and Law attempts to solve the Robot Sociability Problems for Human-Robot Co-Exist
- There are Two main codes for Social Robotics
- **Rule Zero** for building an **A+** LCSR
 - 敬天愛人
 - (Revere Nature, Love people)
 - 千里の道も一歩より
 - (Even a journey of 1000 miles starts with the first step)

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- Thank You for Your Attention !!