



Application of USIT to Compact Umbrella

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※MPUF (Microsoft Project Users Forum)

NPO aiming at penetrating various methods related to Project Management. Members aim at improving themselves through events, seminars, online community, study group meetings, etc. about various subjects related to project management. The USIT/TRIZ Study Group was launched in April 2007 as a new group among MPUF's nearly 20 study groups, and has currently about 150 members on line.

USIT Approach



1. Problem Definition

Well-defined USIT Problem (Root causes analysis)

2. Closed World Method

Analysis from existing minimum sets of objects
CW-diagram → O-A-E statements → Qualitative-Change Graph

3. Particles Method

Analysis from Ideal Solution Back to its unwanted effect
Morph cartoon → And/or tree

4. Uniqueness

Examine Temporal & Spatial Uniqueness

Pluralization
(focus on
Objects)

Dimensionality
(focus on
attributes)

Distribution
(focus on
function)

Generification-type
solution

Transduction-type
solution

Compose of Solution Idea Concept






6. Idea Concept

1. Problem Definition



【1-1 : Analysis for Current state】

← Focus Point →

	C1 Before Using Open Action (not yet Wet) Action	C2 State of Using Condition	C3 使用直後 Close Action Action	C4 After Folding Condition (already gotten Wet) Condition
Current	◆Pull up runner 	◆Polygon(6~8) 	◆Pull Down Action 	◆Rolled up  
Enumeration Desirable Effect (DE)	<ul style="list-style-type: none"> • not necessary to put power. • It doesn't take up space. 	Even if the wind is strong, it easily supports it. strong in the wind. Don't be blown inside out Hands free	<u>Operation is easy</u> <ul style="list-style-type: none"> • fold quickly ⇒Time is not spent. • More Compactly • The hand is not wet. 	<ul style="list-style-type: none"> • Install Compactly. • No Occupations in the bag. • Surroundings are not wet • Losing free bag
Enumeration Un Desirable Effect (UDE)	Opposite expression above-mentioned		Opposite expression above-mentioned	

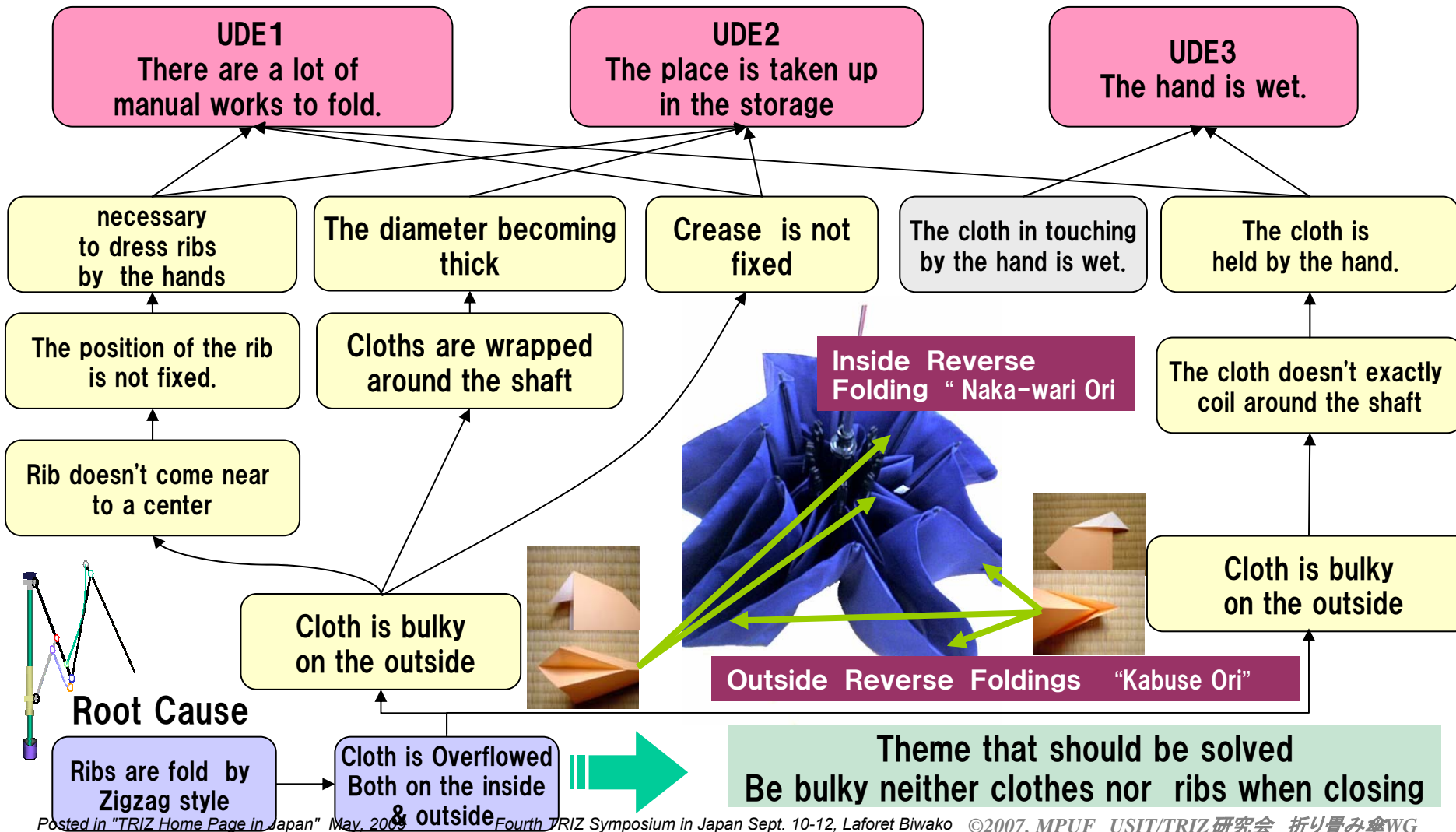
1. Problem Definition



【1－3 Investigation of Root Cause】

※Here We've used CRT (Current Reality Tree) using in TOC Thinking Process

※UDE : Undesirable Effect => Current holding Problem

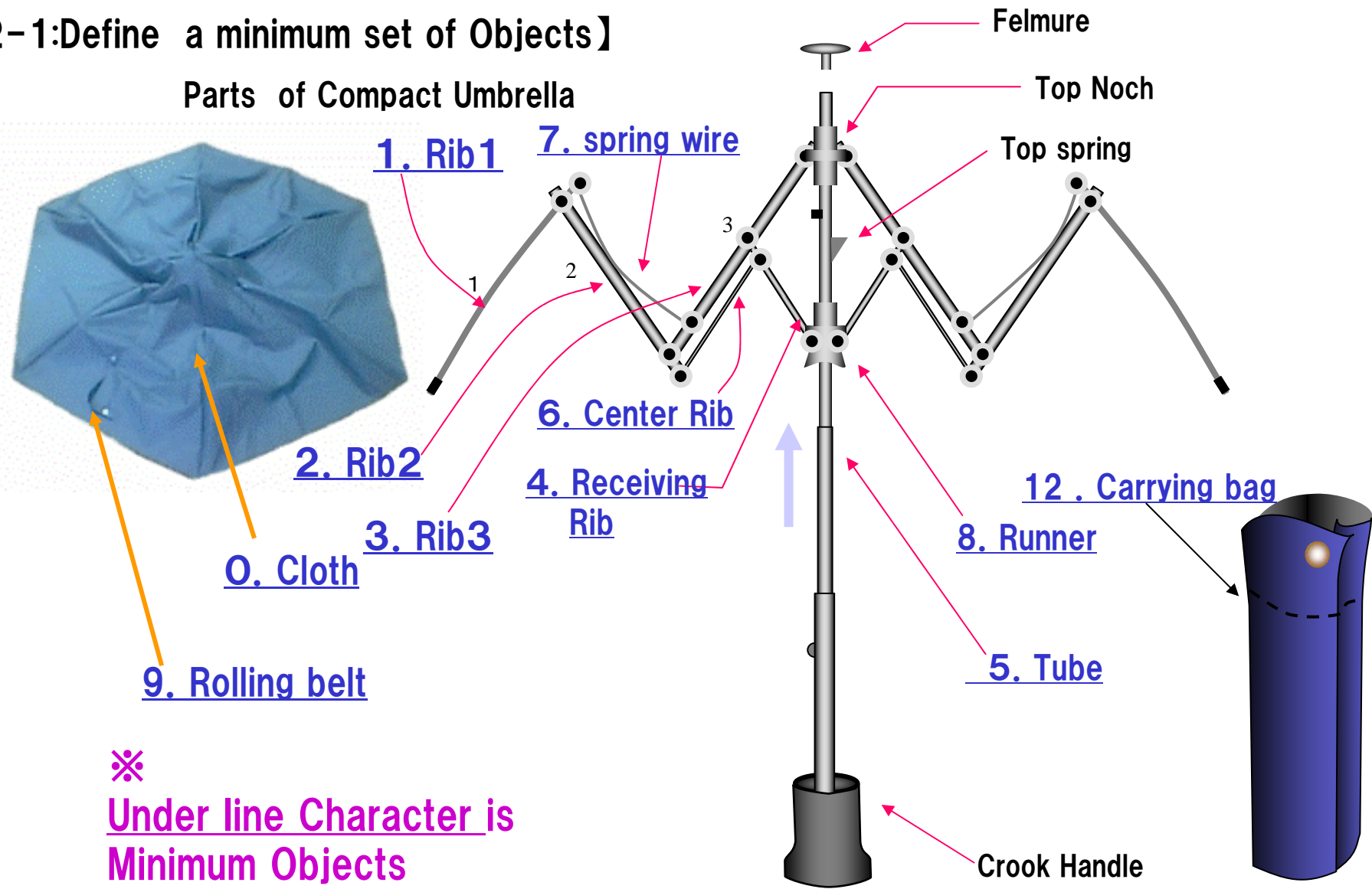


2. Closed World Method



【2-1:Define a minimum set of Objects】

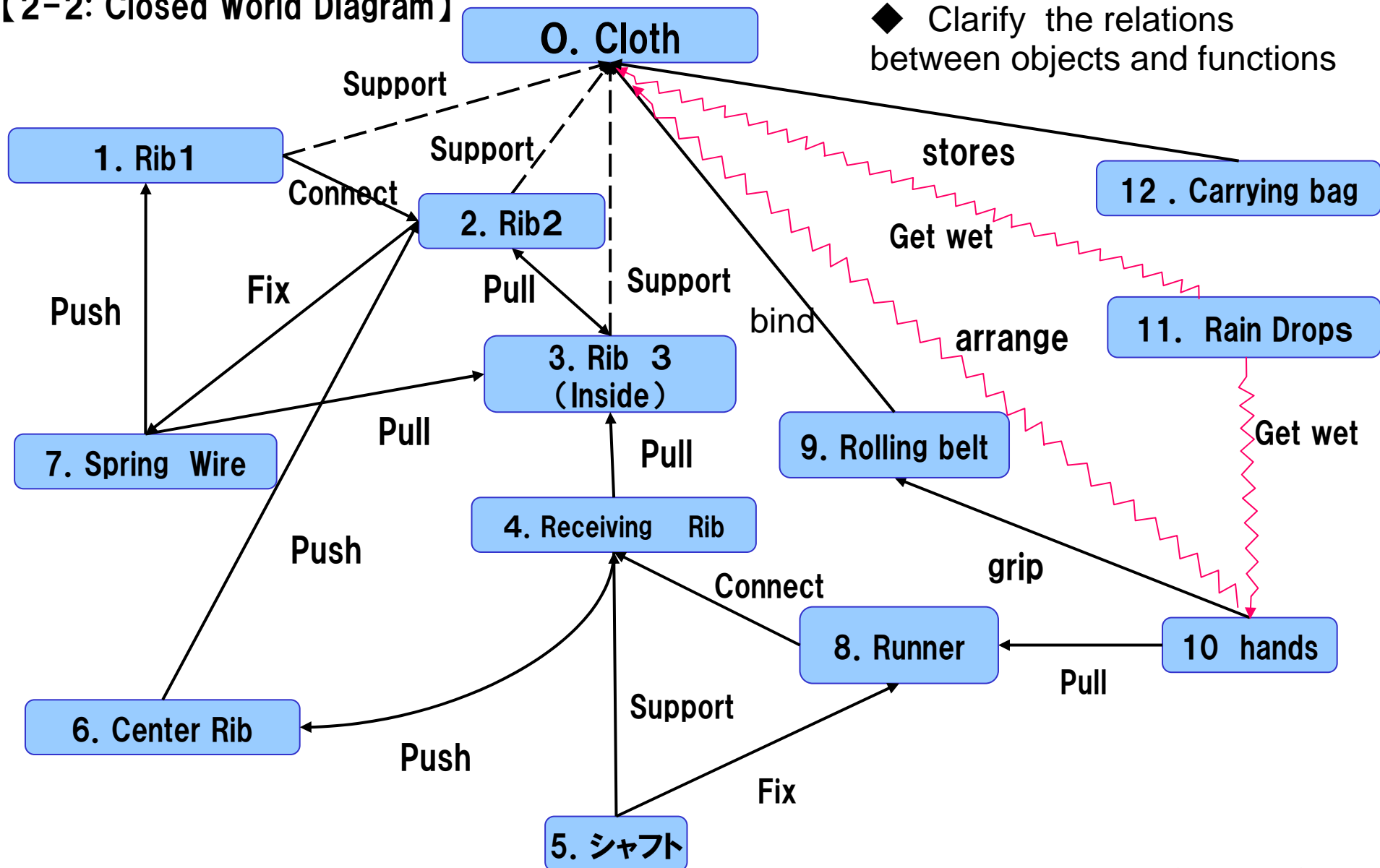
Parts of Compact Umbrella



※
Under line Character is
Minimum Objects

2. Closed World Method

【2-2: Closed World Diagram】



2. Closed World Method



【2-2:
List up the Attributes by Objects 】

And then
Select strong effect factor (★)


Show below:
Selected sample of Ribs & Cloth &
Shaft

O Cloth	1, 2, 3, 4, 6, 7 Rib	5 Shaft
Solid ★hardness ★Plural ★shape ★water proof ★easy to crease ★elasticity ★Volatility ★Water-shedding quality ★Easiness to dry ★Water permeability Easiness of wrinkle to adhere Restoration ★Thickness Weight ★Volume ★SealingAbility ★Easiness of wrinkle	Solid ★hardness ★Structure of connection ★shape weight ★Elasticity ★fixable ★Movability ★Length	Solid hardness ★ structure of connection Strength ★length ★surface shape ★spring power of spring ★shape of Top spring ★fixability ★shape of Pole

【2-3:List up 】

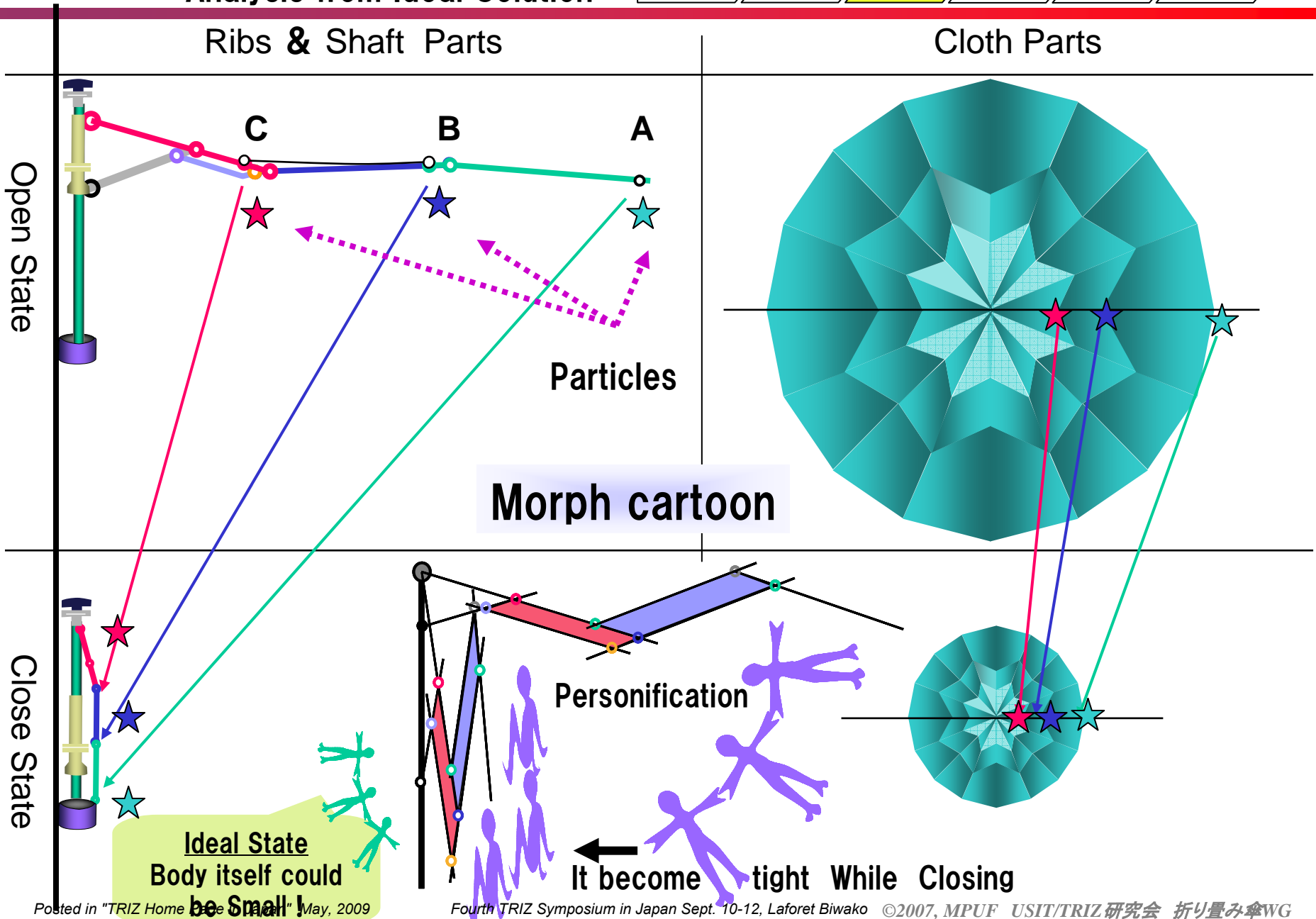
This time We've used QFD-Chart in place of
QC-graph . And Investigate relation between UDE
Undesirable Effect & RC (Root Cause) and attribute of
each objects

Show below:
Selected sample of Ribs & Cloth)

<div></div>		Objects													
		Rib					Cloth								
		attribute	a 1	a 2	a 3	a 4	a 5	b 1	b 2	b 3	b 4	b 5	b 6	b 7	b 8
			hardness	Shape	elasticity	number	length	hardness	shape	Waterproof	Easiness to fold	Easiness to dry	Thickness volume	Restoration	elasticity
		X													
UDE	There are a lot of manual works to fold	Y 1	◎	◎	◎	◎	◎	◎		○		◎			
	There are a lot of manual works to fold	Y 2	○	○	◎	◎	△	◎	◎		◎		◎		
	The hand is wet	Y 3							○	◎		◎			
Root Caus	There are a lot of manual works to fold	Y 4	△	○		◎	◎	◎	◎		◎		◎		

3. Particles Method

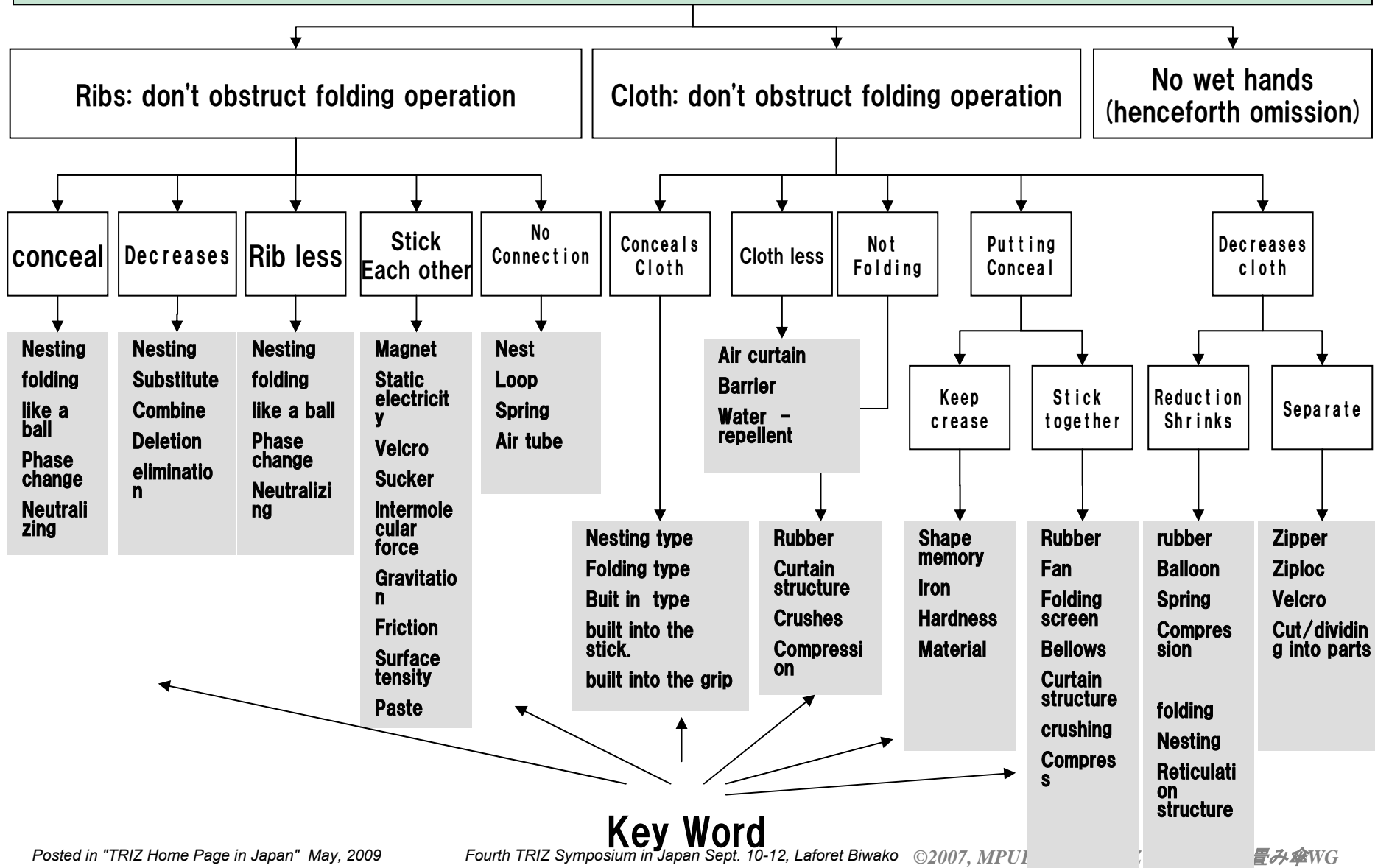
Analysis from Ideal Solution



3. Particles Method And/or tree



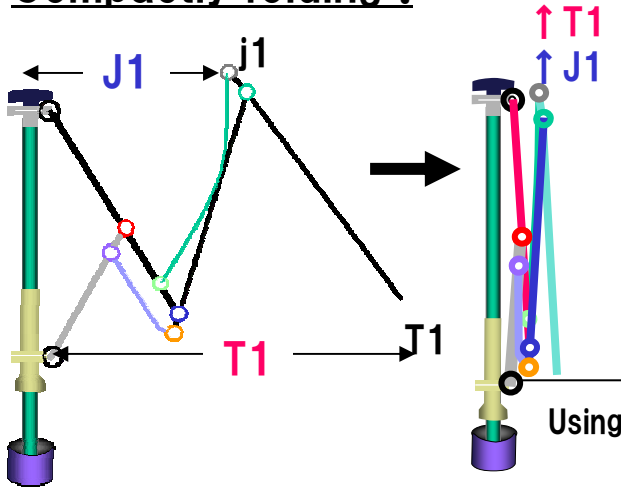
Desirable Effects : as easy operation in folding & compact as possible & without wetting hands



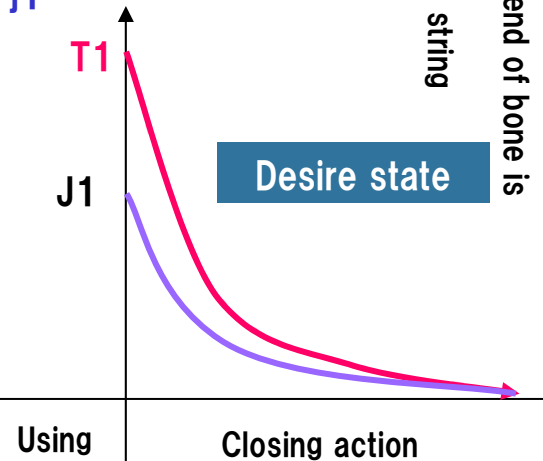
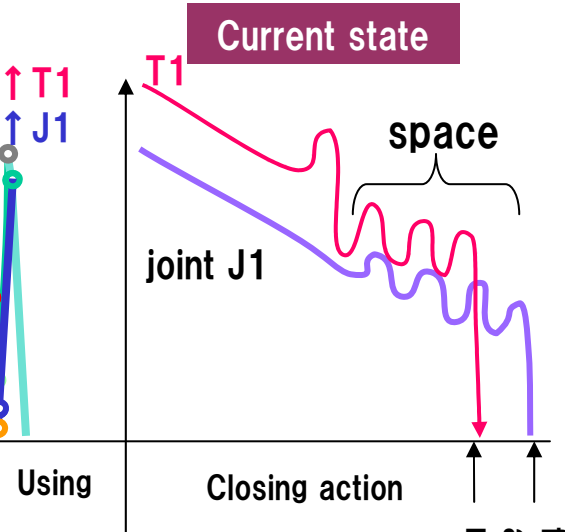
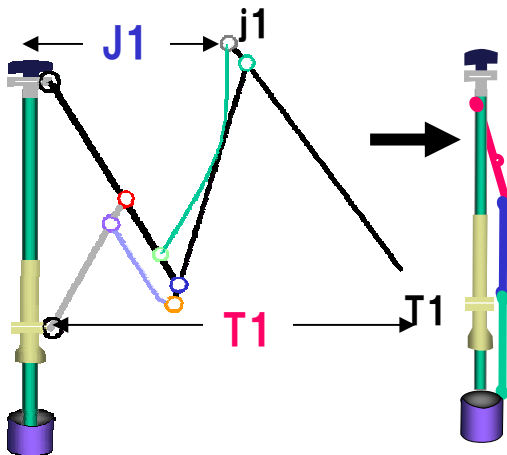
4. Uniqueness

【4-1 : Examine Temporal & Spatial Uniqueness】

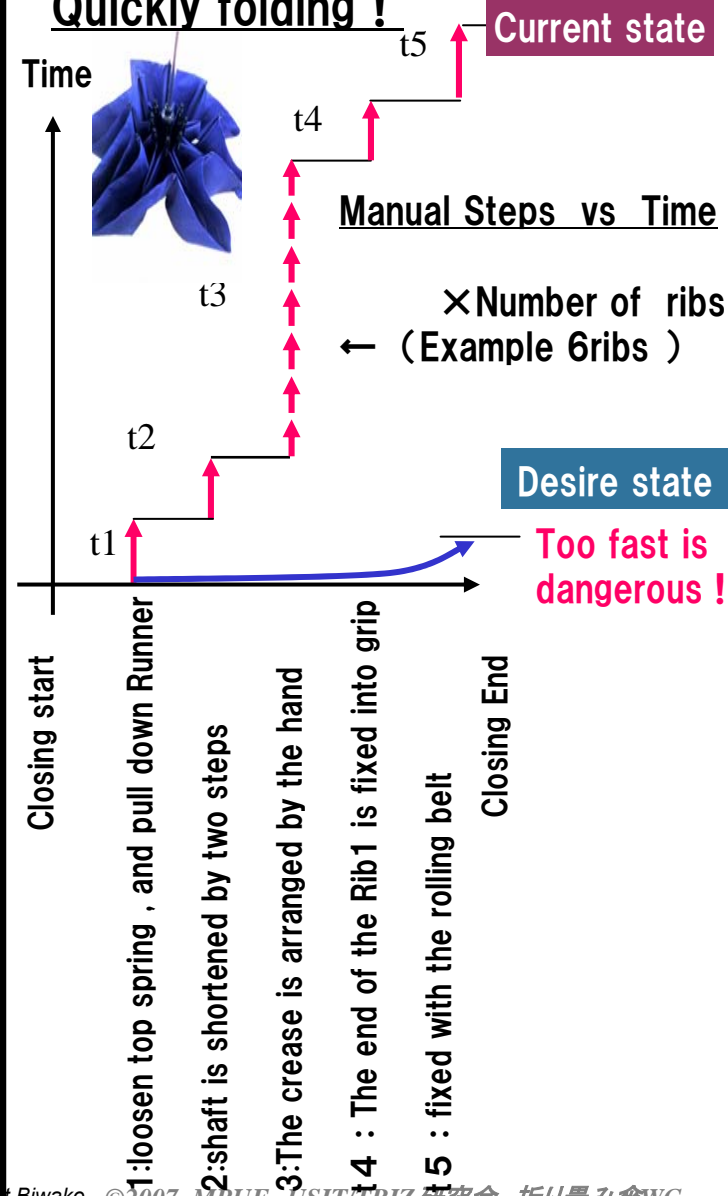
Compactly folding !



T1:Terminal1:Distance between Center to T1
J1:Distance between Center to j1



Quickly folding !



5. Solution Procedures



【5-1 : Idea Creation — Primary 】

①Closed World Method ⇒

- activate useful function or inactivate harmful function.
- Add Objects or Activate attributes

②Particles Method ⇒

- activate useful attributes
- increase or decrease objects
- change a function to another

③Uniqueness ⇒

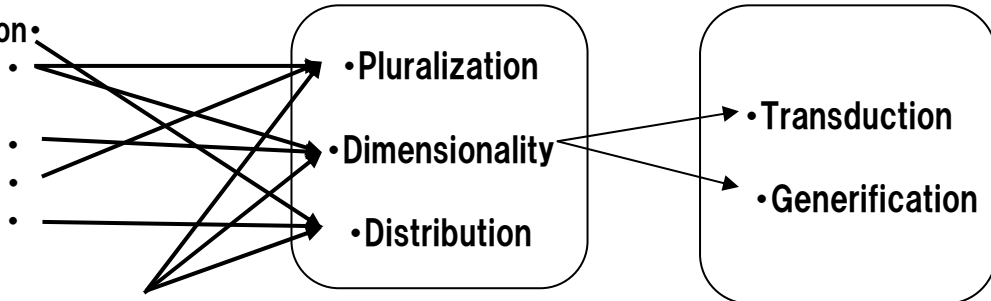
- Change spatial or temporal point of view

Primary Idea Creation

- Pluralization
- Dimensionality
- Distribution

Secondary Idea Creation

- Transduction
- Generification

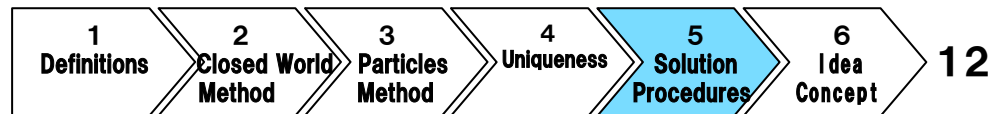


- Air pressured ribs
← Air Battens of Yacht
- Cloth → Panel Structure
- Joint less → Sea anemone type
- Less ribs & cloth
→ Thin fiber like a dandelion
- Compound type cloth by a thin fiber.
- Disposable Structure
like a paper or sponge
- Cloth of thin sponge structure
to shed water
- Sponge that doesn't inhale water

- Air inflate structure.
- Fold machine of umbrella
- Mechanism that turn out the surface side of cloth by one operation
- Board umbrella like fan
- Good retractility for direction of radiation
- The bone persists in magnetism.
- The cloth adhere by magnetism each other.
- Multiple ribs
- Pinwheel structure
- Material that extends while water gets wet
- Cloth like paper folding
- Walking stick of jugglery
- Window shade that opens radially

- Not folded by pull action
but folded by pushing.
but folded by rotate
but folded like Acordeon
but folded like the fan
- It is possible to fold to the A4 panel size.
- Horizontal structure of window shade
(Form with a multiple panel.)
- Umbrella of fan type
- Air curtain structure
- Cover that have function to squeeze
- Water-shedding quality to the cover.
- After use water disappears.

5. Solution Procedures



【5-1 : Idea Creation — Secondary】

Categorize (Grouping)

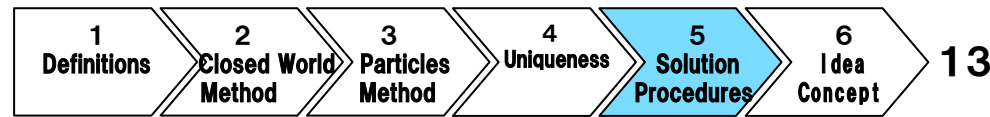
⇒ Generification ⇒

Transduction

Shaw below one part. (Actually we generate about 100 ideas)

Category Large	Category Middle	Category Small	Generification Add ★	Transduction Add ★
Close Not be bulky Gp	Creaseless Gp	Panel Gp		★Panel cloth ☆Not Cloth but Board ☆A celluloid board Rib in the sale of yacht that hardens the cloth Air Battens of Yacht The outside of the cloth is hard. Cloth is soft when shutting and hard when using . Panel style fan likea chinese folding fan Idea A—1
		Soft Rib Gp		★1Loop Rib ☆When twisted becomes to 3 circle loop Air born Type Bone that rolled coil (like bone of lantern) Idea B
	Fixing Crease Gp	Folding Gp		★Miura Or bamboo hat type umbrella ☆Miura ori with wire spring power Like a japanese folding fan Idea C
		Bellows Gp		Acordeon Folding in pleats japanese lantern like bellows
Ribs Not be bulky Gp	Junction Connecting Gp		↓ Omission As follows	
	No JunctionGp			

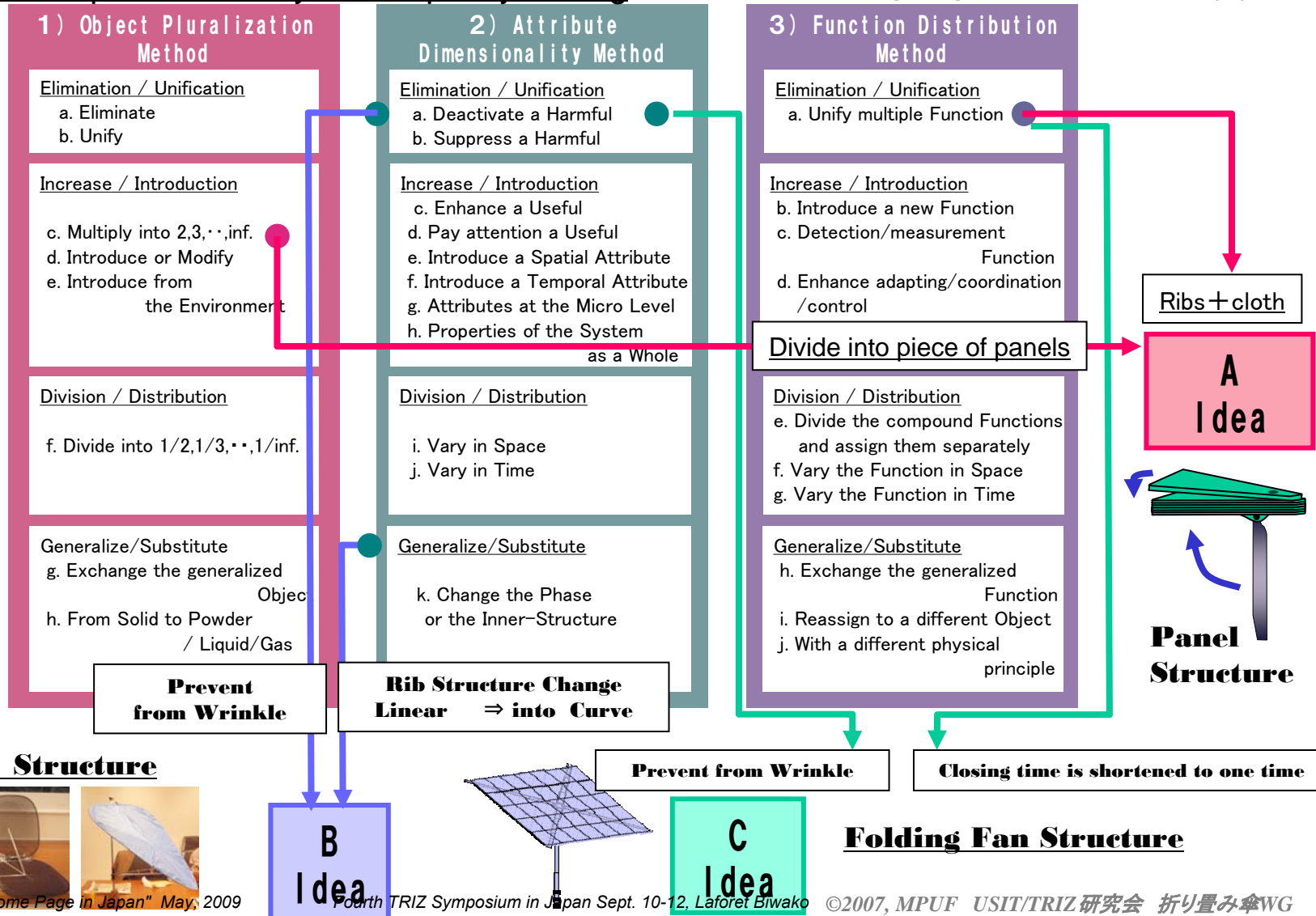
5. Solution Procedures



5 : Solution Procedures – Summary

Idea Concept for Quickly & Compactly folding

(※ The idea of not getting wet is omitted in this paper)



6. Solution Concept

Idea Concept: Quick folding & Compactly storing

A: Panel Gp

Combine the functions of Ribs & Cloth ,then devise

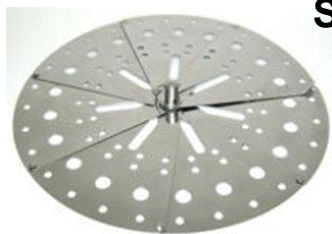
3. Function Distribution Method 3a: Unify multiple Function

Ribs (Support cloth function)+cloth (protected from getting wet.)

1. Object Pluralization Method

1 f : Divide object into 1/2, 1/3, • • , 1/inf
Divide into piece of panels

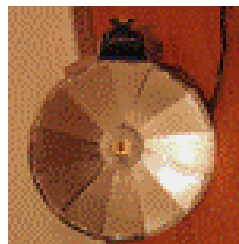
◆ Idea Concept A-1



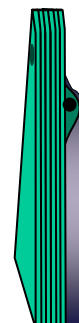
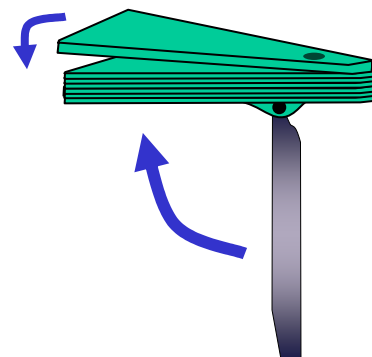
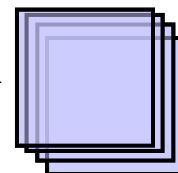
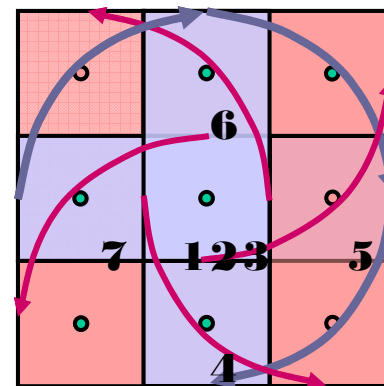
Size Changeable Lid



◆ Idea Concept A-2



Flash Type



6. Solution Concept

Idea Concept: Quick folding & Compactly storing

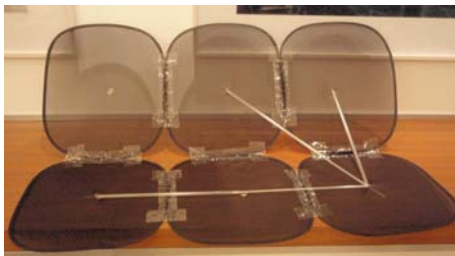
C: Loop Rib Gp

2k : Change the Phase or the Inner-Structure

◆ Change the structure of Object (Ribs) Linear into Curve

2a : a. Deactivate a Harmful Attributes ◆ prevents from wrinkle of cloth

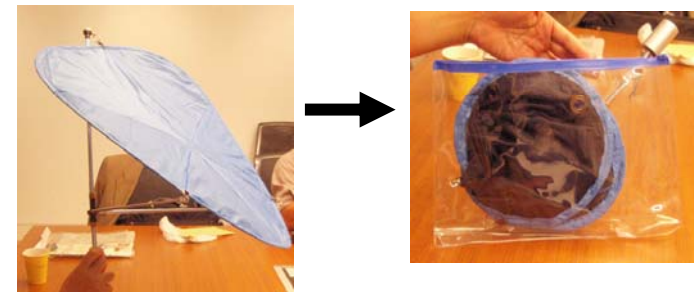
Sample1



Sample2

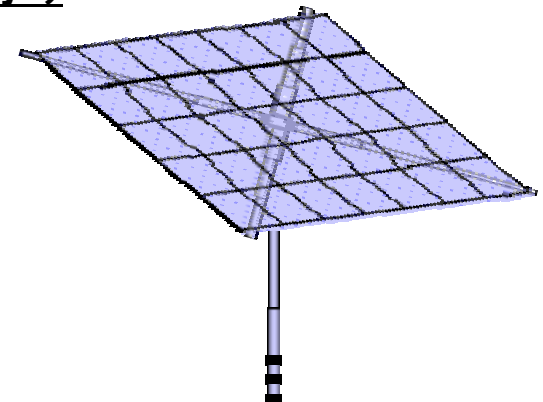
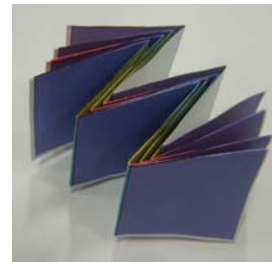
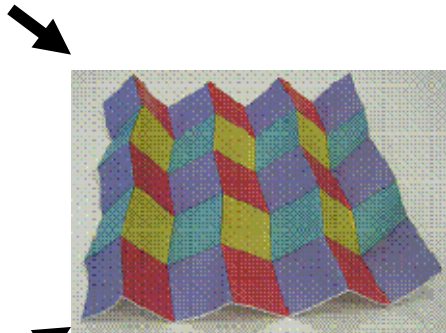


Sample3



C: Folding Gp Miura Ori (← Open quickly fold quickly)

3a : Unify multiple Function ◆ Fold & Unfold at one action



1. Introduction of the USIT Approach for the Problem of Compact Umbrella

◆ We could have experienced USIT technique by a familiar theme, and have found the effectiveness At the same time. The excellent point of the USIT is to arise naturally the solving point of the problem while focusing there **object, attribute, and function** and combine them with unique feature of spatial or temporal side.

2. Various solution ideas and conceptual prototypes.

◆ Though it was not a purpose to output the Best solution but after adopting USIT approach, We could output various solution ideas of Compact Umbrella ie: Panel Style、Loop-rib Style、Folding Fan shape and so on.

3. New devices for USIT approach

- ◆ Various devices for improving USIT method are bone and the effectiveness was able to be shared among members
 - ★ Root cause analysis enhanced by a TOC thinking process
 - ★ practical use of QFD in Quality—Change graph
 - ★ personification for Object, and (d) template of the USIT process