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A New Paradigm of Creative Problem Solving (3) Usage and Significance of the Six-Box Scheme in USIT

Toru Nakagawa
 (Osaka Gakuin Univ., Japan)

<http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/>

The Second TRIZ Symposium in Japan
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Outline of Talk

We reconsider the fundamental scheme for Creative Problem Solving.

The Four-Box Scheme has been recommended widely:

Abstract the problem, Solve it in a model space, and

Concretize it into a solution.

However, no further general description is given, and hence this often leads to (enforced) analogical thinking with hints from KBs.

We have constructed the Six-Box Scheme

by clarifying necessary information in every stage of problem solving.

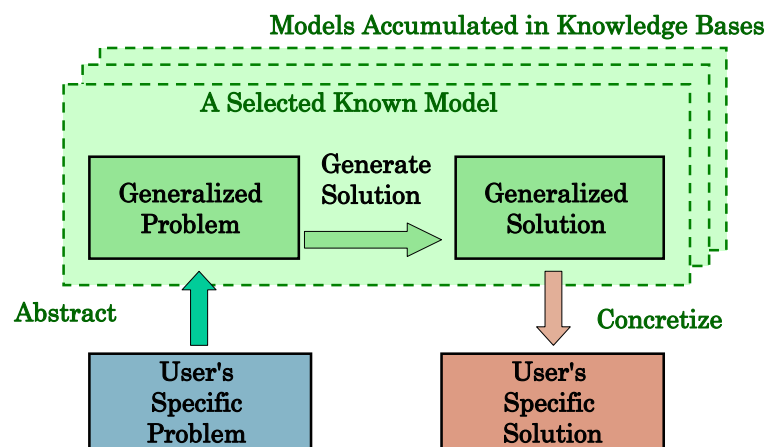
It gives A New Paradigm for Creative Problem Solving.

The scheme can be performed smoothly with USIT.

Two case studies of creatively solving everyday-life problem:

- (a) How to fix a string shorter than the needle at the end of sewing
- (b) A system for preventing from our leaving things behind.

Traditional Paradigm of Problem Solving Basic Scheme in TRIZ == in Science and Technology



Many models ==> How can we select one? How to abstract?

TRIZ in the traditional way: [Mann's textbook as well]

Principal Models for Solution Generation request their own analysis methods (for abstraction):

- Contradiction Matrix → Inventive Principles
- Su-Field analysis → Inventive Standards
- ARIZ (for Phys. Contradictions) → Separation Principle
- ... → Trends of Evolution

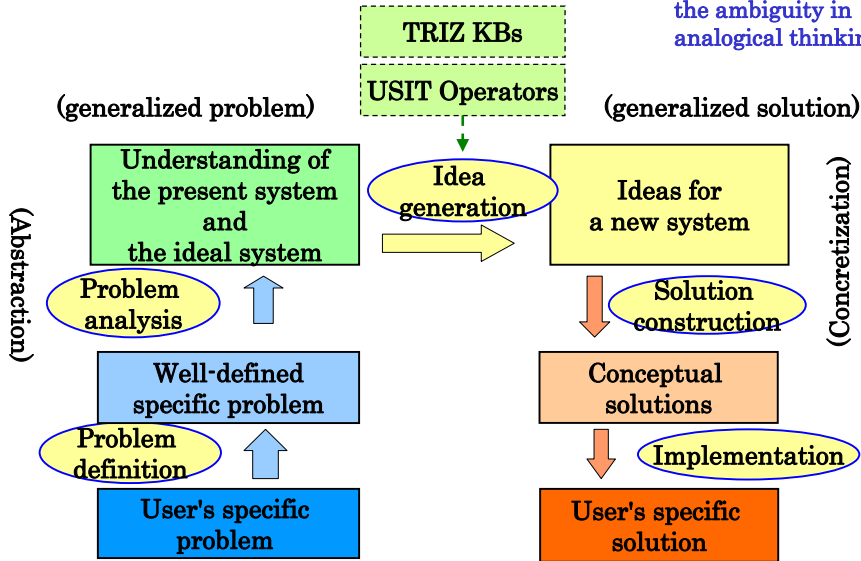
Separate analysis methods provide insufficient and narrow understanding of the problem.

→ The solution process is confusing and not effective enough.
 Difficulty in learning the overall process of TRIZ.

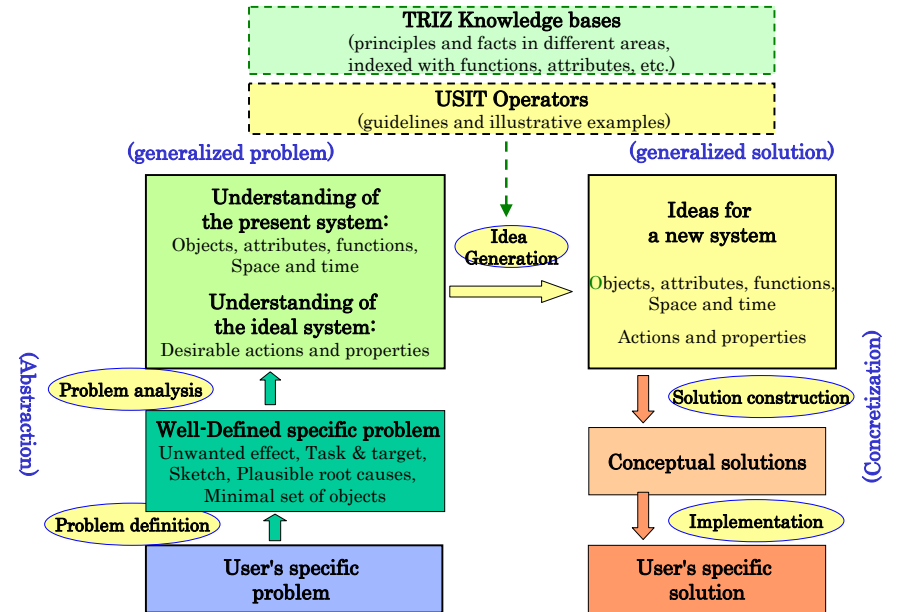
The lack of a clear overall structure in TRIZ is the root cause of the "TRIZ slow-penetration problem".

A New Paradigm for Creative Problem Solving Six-Box Scheme in USIT

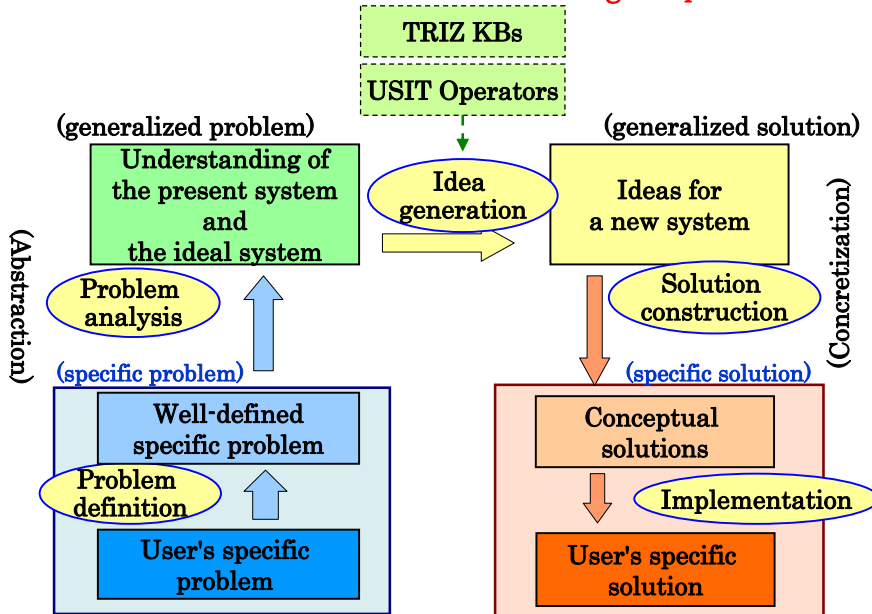
We have overcome the ambiguity in analogical thinking.



Overall Structure of Problem Solving in USIT

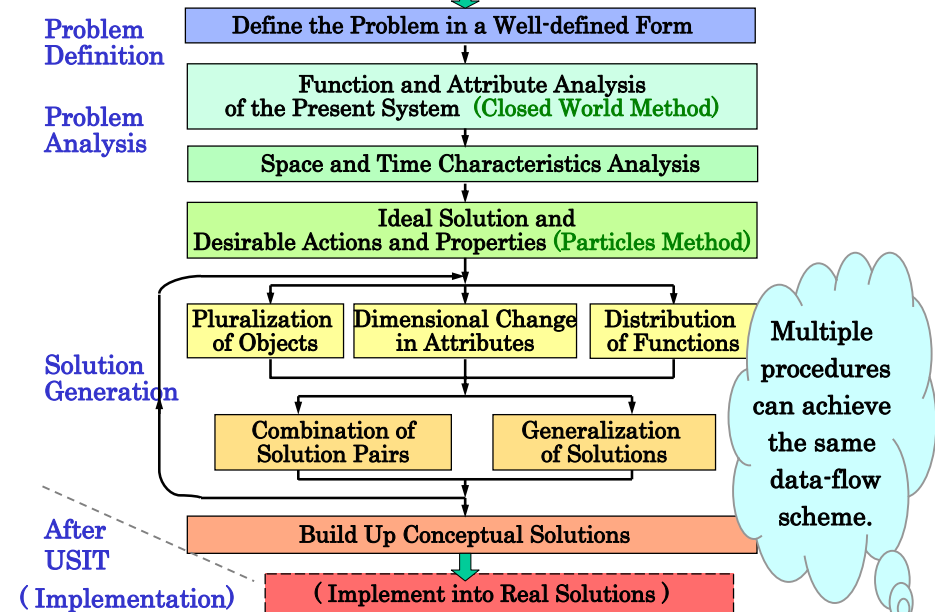


6-Box Scheme of Creative Problem Solving : Implication(1)



USIT Procedure [Flowchart]

[T. Nakagawa, Mar. 2005]

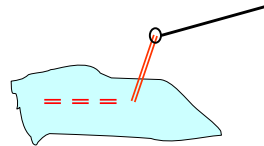


Everyday-life Case Study: How to fix a string shorter than the needle at the end of sewing

Define the Problem:

- (a) **Undesirable effect:** The string is shorter than the needle and prohibit applying the standard way of making a knot.
- (b) **Task statement:** Devise methods for fixing the string left shorter than the needle.

(c) Sketch:



(d) Plausible root causes:

The standard way of making a knot is applicable only when the string left is longer than the needle.



(e) Minimum set of relevant objects:

Cloths, string (already sewn), string (left), the needle

Problem Analysis (1): Understanding the present system

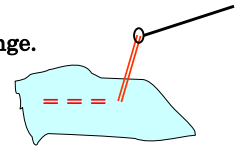
(1) Functional analysis: What is the function of the Needle?

- A base for making a loop of the string;
- A guide for passing the end of the string through the loop



(2) Attribute analysis: Properties taken granted form the Constraints:

- The string does not expand = Its length does not change.
- The needle is hard = No change in shape and length.
- The needle is thin = The hole is small
- = Difficult to pass the string through the hole.



When any of these constraints is lifted, there appears a novel solution.

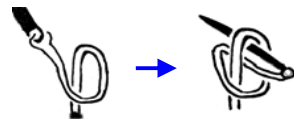
(3) Analysis of time characteristics: Processes of sewing:

Solutions at the final stage and solutions at any earlier stage.

(4) Analysis of space characteristics: A knot makes the string thick at the end.

Watch out about the topology in making a knot and in the 'hole and string'.

Several known solutions:



Difficult to make the loop of string in the space; need some practices



The hole of the needle has a slit, thus the string can be passed and removed without cutting the loop of the string. (a commercial product)

Problem Analysis (2): Understanding the Ideal system

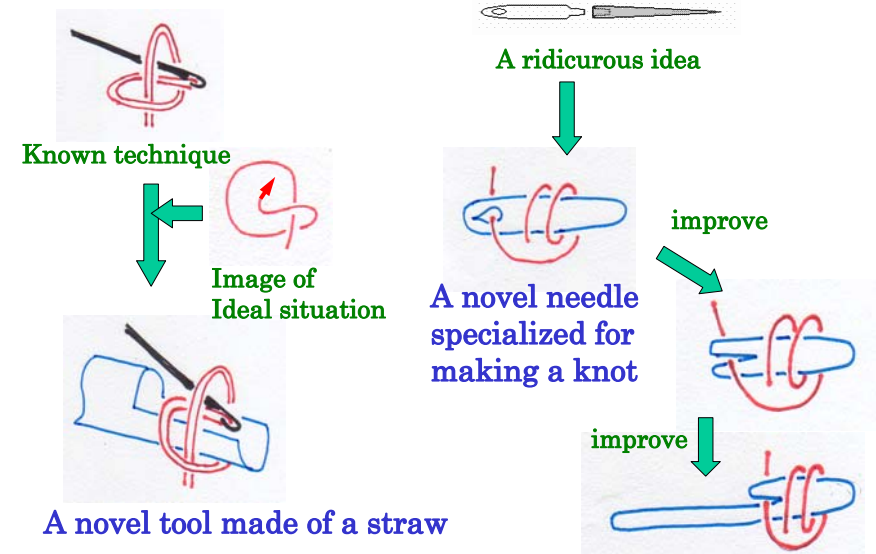
Ideal arrangement of a sting in space for making a knot



It should be nice if we could hold the string in this arrangement in the space.

Solution Generation:

Generate Ideas and Construct Solutions



A System for Preventing from Our Leaving Things Behind

Define the Problem (after some discussions) :

(a) Unwanted effect:

We happen to leave our things behind and get them lost.

(b) Task statement:

Devise a system for avoiding and preventing from our leaving things behind.

(c) Sketch:

'Scenario' (processes along the time)

get on a train --> put a bag on a shelf -->

.. --> stand up the seat

--> get off the train leaving the bag behind



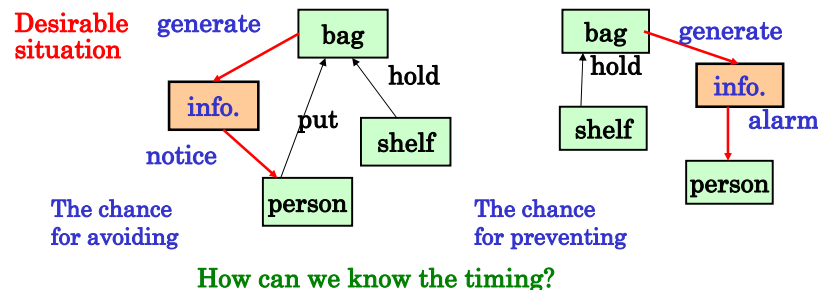
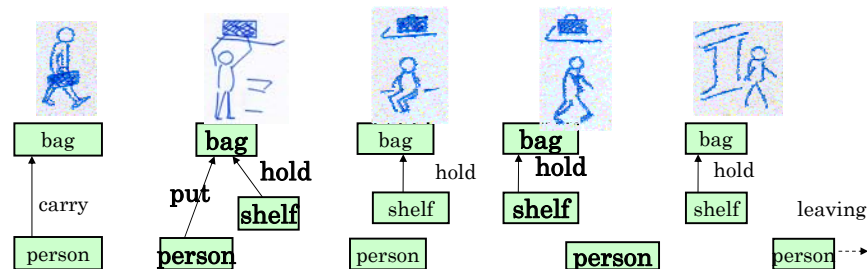
(d) Plausible root causes:

Not able to recall it at the timing necessary to do

(e) Minimum set of relevant objects:

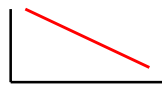
The person, the thing, and the place

Analysis of the Present System: Functional Analysis (along the Time)



Analysis of the Present System: Attribute Analysis

likelihood of leaving a thing behind



The thing: Troublesome to carry, Becoming unnecessary.

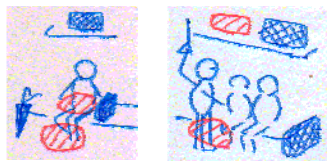
Large, Remarkable, Bright color, Carrying around always,

Person: Busy, In a hurry, Tired, Sleepy, Careless, Thinking something else, Reading a book

Expensive, Important Careful always, Awake

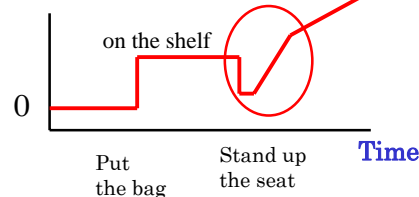
The place: Environment:

Analysis of Space Characteristics



less likely
more likely

Distance between the bag and the person



Analysis of the Ideal Situation (Particles Method)

Present situation

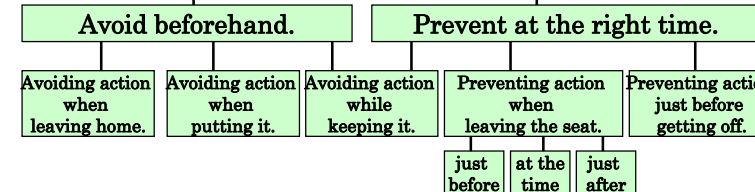


Ideal situation



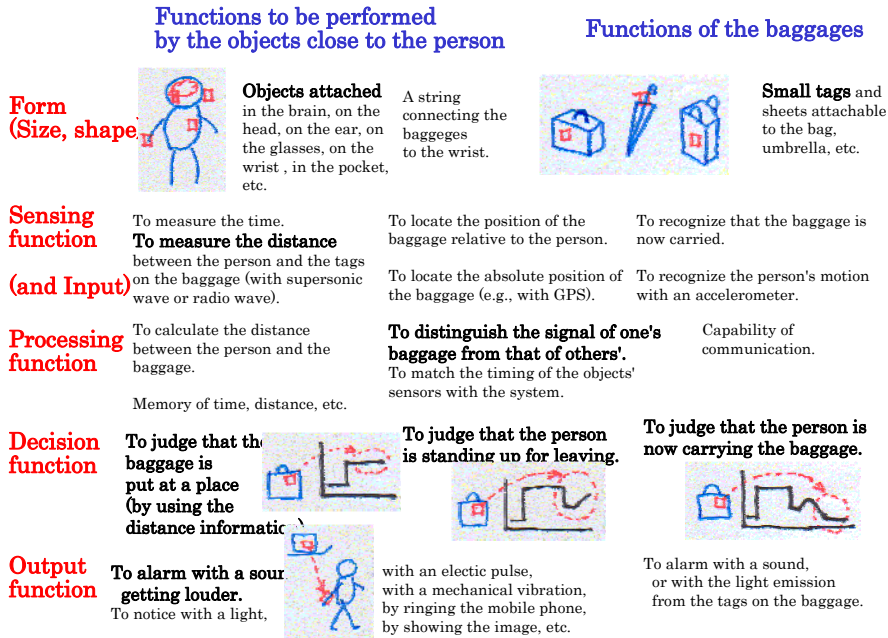
× × "Particles"

(Particles) Avoid and prevent from our leaving things behind.

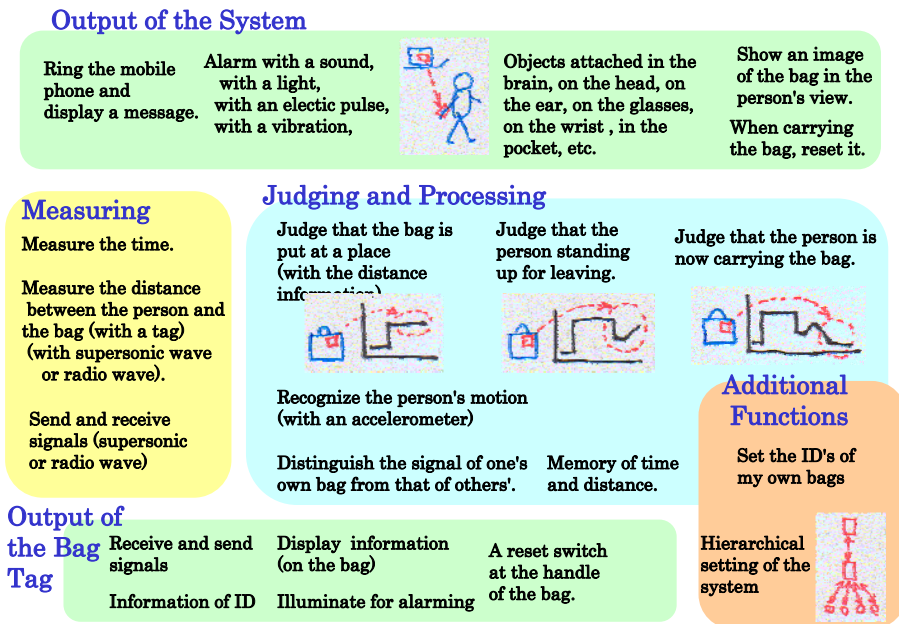


Consciousness of the person, Action onto the person, Desirable action of the things

Solution Generation: (1) Generate Solution Ideas



Solution Generation : (2) Building Conceptual Solution



Six-Box Scheme of Creative Problem Solving (in USIT)

