U-SIT And Think News Letter - 56

Updates and Commentary

Unified **S**tructured **I**nventive **T**hinking is a problem-solving methodology for creating unconventional perspectives of a problem, and discovering innovative solution concepts, when conventional methodology has waned.

Dear Readers:

. Mini-lecture 56 discusses the use of the heuristic reciprocity. If you are familiar with reciprocity as a mathematics tool you may enjoy seeing it abstracted for creative thinking.

. See Feedback for additional ideas about the use of symmetry as a heuristic. Two examples of breaking symmetry are given.

. Time magazine, 16 January ’06, p. 89, has an interesting and relevant article “The Hidden Secrets of the Creative Mind”.

3. Mini USIT Lecture – 56
5. Heuristics for Solving Technical Problems

Using the heuristic “Reciprocity”

In continuing the discussion of the use of heuristics in creative problem solving I’d like to point out a subtle difference in their applications. In solving mathematical problems in science and engineering we use heuristics in rational ways to recall specific cases. When solving design-type problems needing an initial concept we use heuristics as less rigorous metaphors. The former use appeals to logical LH-thinking while the latter appeals more to abstract RH-thinking.

Reciprocity offers a good demonstration. Reciprocity, as employed in mathematics, is a theorem used, for example, in generating Green’s functions for solving electrostatic problems. Here complex problems can be solved from known solutions of simpler problems by invoking reciprocity. (See for example an electricity and magnetism textbook treatment of distributed charges and the potentials they produce.)

We convert reciprocity as a theorem into reciprocity as a metaphor through abstraction. As a metaphor, reciprocity suggests to view a problem situation from a different perspective, or a reciprocal perspective. For example, consider different conditions in a problem situation for which solution concepts are known. This may involve moving objects, changing the strength of attributes, changing timing, location, or modifying functions. Try one at a time in small steps and then go to extremes. As these changes are made note their affect on the originally known solution and now on the unwanted effect of the problem. This thought process may be applied to problems whether or not a solution is known.

This difference in how heuristics are applied in innovation should serve as a caution that can be expressed as another heuristic: Make a heuristic abstract, not rigorous, and see what ideas come to mind. This subtlety is the difference in engaging intuitive thinking and pure logic. Don't fear loosing contact with the original problem by drifting into whimsical thinking. The original objects, attributes, and functions keep your mind subconsciously bounded to the real world problem.

The simple exercise of identifying attributes for functions identified while applying reciprocity is productive.

Consider a practical problem of applying reciprocity such as designing a new keyboard for computer input. I normally view a keyboard as an array of rather fragile buttons that fingers must be pressed onto in order to actuate them. A reciprocal view could be that of a key and a relatively massive object approaching and jabbing it. Does this perspective cause any new insights? Let's compare some possibilities.

Interactions with a keyboard key		
	Finger's perspective	Key's perspective
1	to aim at	to withdraw on contact
2	to move toward	to resist
3	to touch	to allow displacement
4	to depress	to close contacts
5	to detect contact closure	to react impulse
6	to retract	to recover position

Note the small steps taken to characterize interactions (functions). They generate more opportunities for discovery by directing our thoughts to each step.

The perspective of one's finger, as shown in the table, seems to be rather conventional. The key's perspective, on the other hand, is interestingly different. How can we make something useful out of these observations? First we identify attributes that support the listed interactions (functions).

Note in the following table the technique of invoking anthropomorphistic words* (and physical words*) to Key's perspective in order to discover a new view of attributes – a heuristic for engaging RH thinking. As usual, you will think of different words than I have.

Attributes of a keyboard key		
	Key's perspective of interaction	Attributes
1	to withdraw on contact	fear*, flexibility, instability
2	to resist	determination*, obstinateness*, resistance*, viscosity, elasticity,
3	to allow displacement	accommodation*, flexibility*,
4	to close contacts	alignment, aim*,
5	to react impulse	forbearance*, restraint*,
6	to recover position	resilient*, elasticity, springiness,

We can pause here, examine the interactions and supporting attributes found for Key's perspective, and see if any intuitive solution concepts come to mind.

Withdrawing and *fear* (1) brought to my mind a non-contact interaction involving repulsion,

attraction (contrarian view), induction, sound, or light. *Withdrawing* and *flexibility* caused me to think of a soft spring, a membrane, and a balloon. *Withdrawing on contact* and *instability* caused an image of a house of cards and a toothpick structure collapsing from an inpulse.

Resisting and *determination* (2) led to an invisible barrier like a pane of glass. *Resisting* and *obstinateness* brought to mind an image of trying to make a mule move. I attempted to relate that to a key and came up with a non-moveable key, which led to inductive or capacitive coupling to replace a mechanical closure. *To resist* and *resistance* brought to mind piezoresistance, which led to a non-contacting key. *To resist* and *viscosity* brought to mind a fresh idea (fresh to my mind). They led to an image of a small squishy balloon filled with a viscous material. A flexible balloon-like button would provide a soft landing for a finger, and its subsequent expansion could cause closure of contacts. *Resisting* and *elasticity* led to images of a spring, an elastomer, a balloon, a membrane, a carpet, and animal fur.

Displacing and *accommodation* (3) suggested to me an image of pushing a solid rod into a box of sand. I didn't immediately see a way of relating this to a key, so I moved on**. Do you? *Displacing* and *flexibility* again suggested a spring, a membrane, a balloon, and the possibility of other elastic components.

Closing contacts and *alignment* (4) brought to mind telescoping tubes, dovetail grooves, pre-positioned membranes, a non-conducting elastic spring with conductors to be brought into contact at each end of the spring, and a springboard and button (telegraph key). *Closing* contacts and *aim* brought to mind a type of accelerometer and switch having a ball that slides down guiding rails to close a pair of contacts. This brought to mind a pair of contacts having one shaped with a convex dome and the other a concave dome for conformal mating, which seems to me to combine guiding and aiming, thus eliminating rails.

Reacting impulse and *forbearance* (5) led to thoughts of large inertia, rigidity, and a way of stopping the incoming finger without displacement for closing contacts – another way of viewing a non-contacting key. *Reacting impulse* and *constraint* made me think of a taut membrane.

Recovering position and *resilient* (6) brought thoughts of a drumhead and a trampoline. *Recovering position* and *elasticity* were a repeat of above ideas, and again for *springiness*.

Summary: This demonstration illustrates how a reciprocal perspective can offer new views of object-object interactions and the discovery of slightly different supporting attributes. In the process of developing details of the new perspective intuitive solution concepts come to mind.

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** Exercises such as this should be time bounded. I limited myself to five minutes from the last table to its following discussion, since I was typing as I was thinking of ideas.

********** To be continued **********

"All research shows that the creative process is basically the same: generating ideas, evaluating them and executing them, with many creative sparks over time."

Professor R. Keith Sawyer, psychologist, Washington University, Time, 16 January 2006.

6. Feedback

. "An example of breaking symmetry as a solution heuristic - fans with unevenly spaced blades are quieter. Even spacing of blades can create constant tones as they interact with the air and neighboring objects. By breaking that symmetry, the generation of a constant tone is impeded." From Matt B. Smith, a frequent contributor.

. This example reminded me of having marching troups break their rymthmic steps while crossing bridges in order to reduce sympathetic vibration.

7. Papers and essays

The following materials can be read by clicking on their titles. Links are also available on the USIT website (www.u-sit.net/Publications)

1. "Injecting Creative Thinking Into Product Flow"
2. "Problem Statement"
3. "Metaphorical Observations"

8. Other Interests

1. Have a look at the USIT textbook, "Unified Structured Inventive Thinking – How to Invent", details may be found at the Ntelleck website: www.u-sit.net (*Note*; not at www.ic.net)
2. USIT Resources Visit www.u-sit.net and click on Registration.

Publications	Language	Translators	Available at …
1. Textbook: **Unified Structured Inventive Thinking – How to Invent**	English	Ed Sickafus (author)	www.u-sit.net
2. eBook: **Unified Structured Inventive Thinking – an Overview**	English	Ed Sickafus (author)	www.u-sit.net
	Japanese	Keishi Kawamo, Shigeomi Koshimizu and Toru Nakagawa	www.osaka-gu.ac.jp/php/nakagawa/TRIZ/
	Korean	Yong-Taek Park	www.ktriza.com/www/usit/register_form.htm
"**Pensamiento Inventivo Estructurado Unificado – Una Apreciación Global**"	Spanish	Juan Carlos Nishiyama y Carlos Eduardo Requena	www.u-sit.net
3. eBook "**Heuristics for Solving Technical Problems – Theory, Derivation, Application**" -- **HSTP**	English	Ed Sickafus (author)	www.u-sit.net
"**Heurísticas para Resolver Problemas técnicos – Teoría Deducción Aplicación**"	Spanish	Juan Carlos Nishiyama y Carlos Eduardo Requena	www.u-sit.net
4. **U-SIT and Think Newsletter**	English	Ed Sickafus (Editor)	www.u-sit.net
	Japanese	Toru Nakagawa and Hideaki Kosha	www.osaka-gu.ac.jp/php/nakagawa/TRIZ/
	Korean	Yong-Taek Park	www.ktriza.com.
Mini-lectures from NL_01 through NL_55	Spanish	Juan Carlos Nishiyama y Carlos Eduardo Requena	www.u-sit.net click on Registration

Please send your feedback and suggestions to Ntelleck@u-sit.net and visit www.u-sit.net

To be creative, U-SIT and think.

