U-SIT And Think News Letter - 14

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_13 demonstrated the use of Pluralization-multiplication as a solution technique. In this lecture the other half of pluralization is discussed – division.
- Any volunteer manuscript reviewers? See (8) below.

1. USIT – How to Invent: the USIT textbook.

2. USIT – an Overview

3. Mini USIT Lecture - 13

Problem Solving Techniques

Pluralization

In NL_13 the mini-lecture introduced the problem-solving technique called pluralization. One tool, multiplication was discussed. In this lecture I will address the other tool, division. Pluralization is directed at objects in the problem situation. It encourages making copies of them by multiplication or division. The copies can be moved to new locations and can have new attributes activated (or deactivated) in order to support new functions. Numbers of copies are to be taken to extremes including zero, meaning to remove an object.

Division applied to the messy ink problem.

We have three objects with which to work in our closed world, ink, paper, and air. The first idea that came to my mind was to consider division of paper. It could be divided into columns, rows, chopped into pieces, or pulverized to fine powder. Division into columns and rows struck me as seeing the paper only as a two-dimensional object. So I wondered about its thickness. Could it be divided into layers? Why not?

[22] Manufacture two-ply laminated paper in which the to-be-inked layer has lower density than the backing layer. This could increase the absorbency (attribute) of the to-be-inked layer, which could hasten drying.

[23] Create an absorbent layer by spraying a powder of pulverized paper onto a backing layer.

[24] Treat the to-be-inked layer of paper with additives that improve its surface tension with respect to the ink: e.g., use a hydrophilic additive for water-based inks. These bonds remove molecules from the liquid phase to the interface.

[25] Combine [24] and [12] (NL_02) to increase surface-to-volume ratio of splat-drops and enable more bonding of hydrophilic molecules.

I seem to be grasping randomly for division concepts and their applications at the same time. It might help first to list just concepts of division and then consider their applications. This led me to the following summary in which the phases of our three objects are noted as distinguishing characteristics.

Division of gas (air):	no division, cells, streams, layers, molecules.
Division of liquid (ink):	no division, cells, streams, jets, droplets in a gas, globules in a liquid, inclusions in a solid, molecules.
Division of solid (paper):	no division, strips, laminate, powder, fibers, particles, molecules.

Solid is treated as being initially in the form of a thin sheet, in its division above.

This list of division concepts can now be compared with the lists of attributes identified in the QC-graphs (NL_10). Such comparison may reveal opportunities to activate some of those attributes.

Thinking of ink viscosity (NL_10) suggests altering the physical structure of ink at the molecular level. A source is needed for molecules to be activated for this purpose. Molecular division of gas brings to my mind the idea of a getter, as used to lower the pressure in a vacuum chamber. An example is a titanium getter pump in which titanium is sublimed onto chamber walls from a hot filament. There it can combine with gaseous molecules on the walls of the chamber. This lowers the vacuum pressure. So why not use gas-phase molecules at the surface of liquid to react with specific molecules of the liquid forming insoluble molecules that would increase the viscosity of the liquid and, in effect, “dry” the liquid?

[26] Incorporate a soluble additive in ink and a reactive one in air that will react with it to produce an insoluble molecule, thus reducing the ability of ink to smear. Treated air could be directed onto the paper as it separates from the inking roller.

Division of liquid into globules, a getter, and gas-liquid reactive additives, brought to mind a pseudo-colloid concept, one different from concept [11] in NL_09. A colloid is a dispersion of micro-size particles of chemical in a continuous gas, liquid, or solid phase of another chemical. I’m thinking of micro-size gas bubbles in a liquid.

[27] As ink is applied to a roller (NL_11), inject a reactive gas into the ink (aerate it) having an affinity for the water (or other component that gives the ink its liquidity). Such small gas bubbles would begin reacting instantly at their gas-liquid interfaces. This would be appropriate for the high speed of newspaper printers. It would allow enough time to flow the ink from the roller to the paper while accelerating the drying process.

Multiplication and division can produce similar results.
Multiplication and division are often questioned in USIT classes regarding their sometimes-redundant results. That is, both methods can lead to the same solution concepts – so why have both? One answer is for redundancy. This redundancy gives our brains a second chance, so to speak, to visit similar territory from different perspectives.

For example, two bodies are in contact. One is hard and has a sharp point at the point of contact. The other is elastic but strained too near its yield point at the same contact. Fix this unwanted effect. Root cause is stress at the point of contact, i.e., force per unit area. Reducing force or increasing area would be desirable. This can be accomplished by multiplying the number of points for suspending the given load or dividing the load among many less-stressed areas. On seeing one of these concepts, the other may go un-noticed until someone else sees the effect the other way, or another way. One person might see the sharp object divided lengthwise and the parts spatially separated to spread the load. Splaying the sharp object(s) into a blunt shape is an obvious option. Splaying the end of the sharp object into multiple finger-like projections from a common shaft is another option. Another person might see the strained object divided and laminated to stiffen it at the point of contact. Of course, the first person and another person, alluded to here, may be the same person at different times and in different moods.

Volunteer manuscript reviewers?

I have a ca. 19,000 words manuscript nearing reviewable, draft-stage. I would like to find a couple of people experienced in structured-type problem solving who would volunteer to give it a critical review. Its subject is a theoretical derivation of heuristics for solving technical problems. It uses an axiomatic basis from which to deduce a set of self-consistent abstract tools – heuristics for solving problems. Examples of physical-world problems are used to illustrate the analysis and application of newly derived heuristics. However, the heuristics are abstract and couched in graphic metaphors. The manuscript is targeted for problem solvers familiar with, or deeply interested in, the use and understanding of structured problem solving.

If interested, please respond to Ntelleck@u-sit.net