

Klondike versus Homing Solution Searches

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Introduction

This article follows on from previous ones discussing in one instance the space between the generic solution triggers offered by TRIZ and the specific solutions desired by a problem solver (Reference 1), and in the other, the optimization versus innovation debate discussed in Reference 2.

The title and inspiration behind this article comes from a chapter in *Inventive Minds* written by David Perkins (Reference 3). The chapter 'The Topography of Invention' introduces the idea of 'Klondike' and 'Homing' solution search strategies. A Homing strategy is one in which the local conditions of the problem suggest to the solver that a given direction is correct, and thus the solver's task becomes one of homing-in on an optimum. A Klondike search on the other hand - as in 'searching to find the Klondike' - is indicative of a rather more random solution prospecting activity.

Perkins uses a topography analogy to help discriminate between the two search types. A version of this analogy is illustrated in Figure 1.

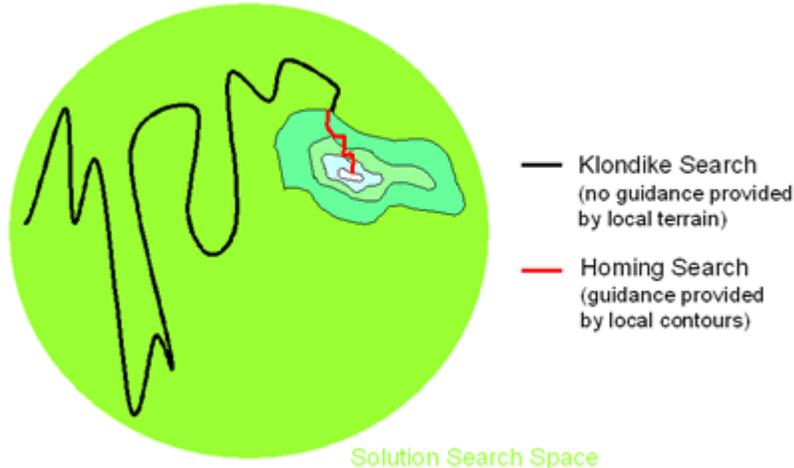


Figure 1: Topographic Analogy Between Klondike and Homing Solution Search Strategies

The analogy uses the idea of contours to represent the presence or otherwise of problem solutions. The idea of a local valley or trough is used to indicate the location of an 'optimum' solution - i.e. lowest topographic point = optimum solution. In the analogy, the gradient of the local terrain surrounding the problem owner's current position is the thing that prompts a shift from Klondike to Homing search strategies. Presence of a downward gradient is indicative of a heading towards an optimum solution, while upward gradient is indicative of a move away from an optimum. Zero gradient is indicative of a Klondike space in which there are no clues to guide the problem solver.

To take the Klondike analogy a little further, before any gold was found, the search by prospectors was random (and thus a 'Klondike search'), but as soon as they received their first clues - e.g. finding traces of gold in a river bed - the method of searching shifts to one of Homing. The presence of gold traces in a riverbed is an example of how the local terrain provides homing cues (local gradient) to help point the prospector to the mother lode - i.e. 'search further upstream' is the direction presented in this example.

The analogy is useful and consistent with several parallel problem solving concepts, two of which we will discuss here: The first is a parallel with the Edward De Bono analogy of solution finding being like digging for treasure in a field first discussed in a TRIZ context in Reference 4. This analogy is particularly useful because it serves to remind us that all the time we are searching for lower points in a terrain (and after finding one, then proceeding to dig the hole deeper), we become less and less likely to be able to see the terrain outside of our trough/valley. This is psychological inertia, and both Dr DeBono and TRIZ are trying to encourage us to get back onto the level ground in order that we might see where other troughs and valleys exist or might exist in the future if we choose to dig there.

The second parallel emerges when we turn the topographic map on its side and look at the situation from the new perspective illustrated in Figure 2.



Figure 2: Cross-Section Through Topographic Image of Solution Space

The important concept here is our frequent inability or reluctance to climb a hill (de-optimize) in order to begin the quest to find a better minimum (optimum) somewhere else in the solution space. While this can also be seen as psychological inertia in action, it is actually more profound because it implies that the de-optimize process is actually fundamental to the location of better optima elsewhere. Nature frequently falls into this trap (Reference 5); with evolutionary processes finding it very difficult to permit de-optimized systems succeed over optimized ones. The classic example of this in action is the human eye and the presence of a blind spot because of the way the design bundles and routes optic nerve fibres out of the eye. Millions of years of evolution have optimized the position of the nerve bundle to minimize the extent and intrusion of the blind spot, and it will be very unlikely to now shift to a design in which the nerve bundles exit from somewhere other than the retina.

The Klondike/Homing/topographic analogy is useful and connects well to a number of other ideas in and around TRIZ. The rest of the article examines four such areas - the connection with psychology of different individual character types; the way we can use the TRIZ solution triggers to assist during Klondike searches; connections to DeBono thinking and the TRIZ System

Operator; and the connection between the topographic analogy and that of evolutionary potential and Ideal Final Result.

Klondike versus Homing/Adaptor versus Innovator

One of the main points made by the Perkins topography chapter is that certain individual character types appear happier in *either* Klondike *or* Homing search modes; that because the two require such distinctly different skills, it is difficult to find or cultivate them both in one person. There appear to be distinct parallels here with the Kirton Adaptor-Innovator (KAI) method of establishing character type. Further discussion about KAI in a TRIZ context may be found in Reference 6.

For the purposes of this article, it is worth recording the perceived strong links between the Kirton 'Adaptor' character type and people who are happiest solving problems in a Homing mode. In other words adaptors appear happier at optimization-type problems where the local terrain provides cues to help the solver reach a (local) optimum solution. Innovator character types on the other hand appear happiest operating in the uncertainties presented by Klondike spaces where there is no local terrain contour information to act as a guide.

The principal connection to TRIZ of course when thinking about Klondike search spaces is that the Inventive Principles, the Inventive Standards, the evolution trends, and knowledge/effects databases all provide pointers to help problem solvers find 'good' places to dig for treasure (solutions). These pointers appear to be more liked by and more useful to the Adaptor character type. After the thrill of their first few exposures to the TRIZ tools, strongly Innovator-oriented character types are prone to either reject or search for things outside TRIZ.

Connection To TRIZ Solution Triggers

TRIZ is not the only tool, method or philosophy to offer solution pointers to help navigate Klondike search spaces, but it is easily the most comprehensive. The most interesting link to outside methods comes with some of Edward DeBono's work on the manner in which our brains physiologically operate (Reference 7). One of the most commonly applied of DeBono's strategies for searching Klondike spaces - see Figure 3 - is the random word connector; the problem solver selects a random word from a dictionary and then strives to make connections between that word and the problem at hand. The method works because are very good pattern and connection forming entities. The method is useful in a Klondike context because the random word inevitably takes us to somewhere else (another X) in the search terrain.

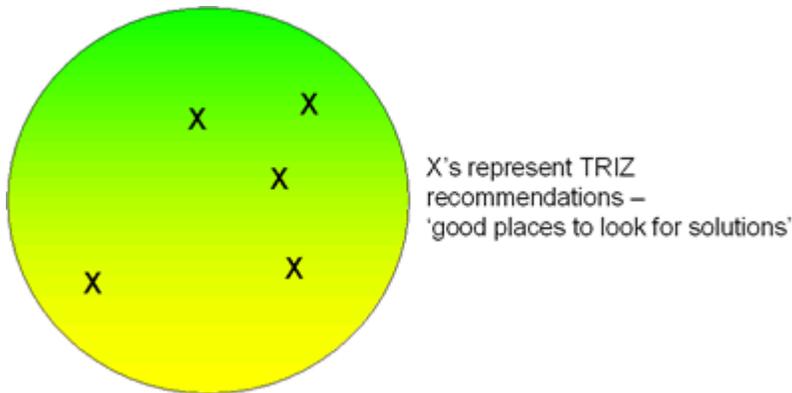


Figure 3: Topographic Analogy And Solution Triggers

The point here, however, comes following a recent experiment in which a group of people were asked to provide a random word to use as a trigger to help conceptualise a better design of product. The product chosen was a mobile phone; the random word was elephant. Importantly, neither the group nor I knew each other's word beforehand.

Figure 4 illustrates some of the connections made by the group after they were asked to suggest how 'elephant' might help to design a better phone.

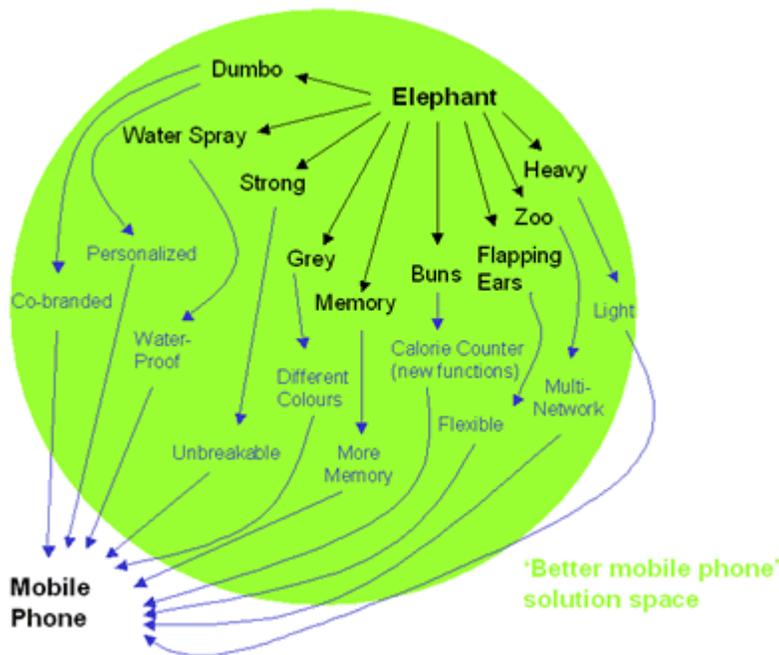


Figure 4: Use of 'Elephant' To Help Design A Better Mobile Phone (partial picture - details omitted for clarity)

After the connection-making phase was finished, the solution ideas generated were analysed relative to the TRIZ Inventive Principles. The working hypothesis was that all of the ideas generated by connecting 'phone' to 'elephant' could also be generated using the TRIZ solution triggers; or, in other words, that the dictionary of useful random words needs to contain only very

few (40 Principles, plus 76 Standards, plus 8/17/20/31 depending how you slice them, trends) of the tens of thousands of words in a normal dictionary.

While in no way considered as exhaustive, it was discovered that all of the connections made by the group were indeed consistent with this hypothesis; each one having a direct correlation to one or more of the TRIZ triggers:

Dumbo	- personalized	- Segmentation trend
	- co-branded	- Mono-Bi-Poly trend
Water-spray	- waterproof	- Beforehand Cushioning/Hydraulics
Strong	- unbreakable	- Parameter Changes
Grey	- different colours	- Colour Changes
Memory	- more memory	- Mono-Bi-Poly(similar) trend
Buns	- calorie counter	- Merging/Mono-Bi-Poly
Flapping	- flexible	- Flexible Shells/Parameter Changes/Dynamics
Zoo	- multi-network	- Universality
Heavy	- light	- Taking Out/Parameter Changes

Subsequent other connections between 'phone' and other random words have similarly failed to generate ideas which the TRIZ triggers would not have obtained more directly. The reader might like to try the experiment for themselves - a bounty for any useful connections that none of the TRIZ triggers would provide!

The continuing hypothesis therefore remains standing that the TRIZ triggers will connect us to all of the good ideas that might be generated by a whole dictionary full of random words; that the TRIZ triggers will point us to all of the good places to dig in a Klondike search space ('all' is a very strong word - as TRIZ is built from the world's scientific excellence, a better description would be 'all of the solutions that would be found by all of the world's past and current inventive minds'. There is always the chance (hope) that there are new as yet undiscovered solution triggers out there in Klondike space).

To offer a more visual image, Figure 5 suggests that a Klondike search space for a problem like 'better mobile phone' contains a number of 'good' places to dig for solutions. We can use a random word to help find these places (and thus risk the possibility that we will not choose enough random words to locate all of the good places), or we can use TRIZ triggers to directly tell us where 'all' (see above) of those good places are.

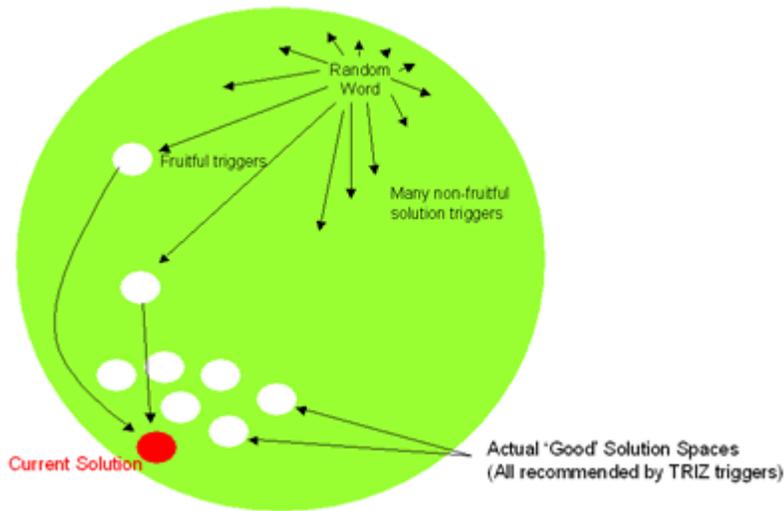


Figure 5: Relationship Between DeBono Klondike Search Strategies and TRIZ

Connection With DeBono and System Operator

Before leaving Edward DeBono connections, it is also useful to make a link between the earlier idea that it is sometimes necessary to de-optimize from a local optimum in order to find a 'better' optimum elsewhere and the DeBono image of problem solving as a journey along a road - Figure 5.

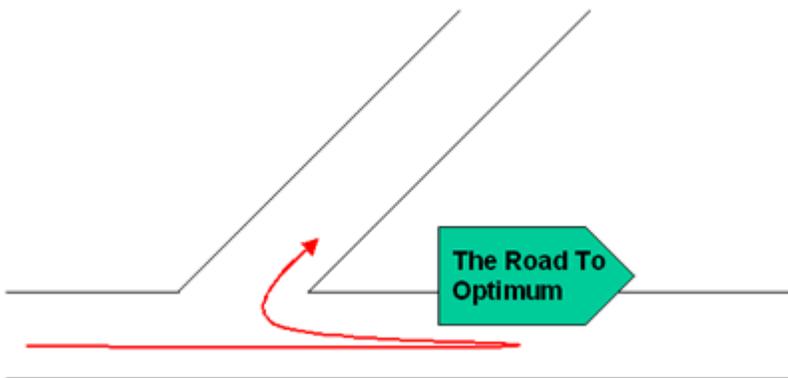


Figure 5: DeBono and System Operator Analogy (the better start-point might be in the Past)

DeBono's purpose in drawing the road-travelling analogy is that sometimes we miss junctions and turnings that might lead to better solutions, and that it is sometimes necessary to retrace our footsteps in order to (re)find the turnings we did not make.

This links very directly to the TRIZ System Operator 'Past' windows and the fact that somewhere in the problem history these turnings might have been spotted and ignored. A commonly applied and often useful strategy in this regard is to apply the TRIZ solution triggers not just to the current system, but to also apply them to an earlier incarnation of the design.

Connection With Evolutionary Potential and Ideal Final Result

The final connection regarding the concept of Klondike and Homing search strategies emerges when we again turn the search terrain image on its side and look at it from a new perspective. This time we make a connection between the depth of the valleys (i.e. measure of 'good'ness of the local solution) and ideality.

Figure 6 illustrates an isometric view of our search terrain showing how increasing depth into the terrain may be related to increasing ideality, with a maximum possible depth relating to the concept of Ideal Final Result. The important point in this figure, however, is the idea of 'evolutionary limits' and the fact that a) any given hole has a maximum possible depth (an evolutionary limit), and b) that this maximum depth may be some considerable distance away from the depth of the IFR. This connection to the idea to that of evolutionary limits - i.e. the maximum depth that any given local hole may be dug and evolutionary potential - the amount of material we could dig out of the hole but haven't yet (strongly linked to the idea of evolving a system to the ends of each of the TRIZ trends of evolution - Reference 8) gives another useful image of the problem solving process.

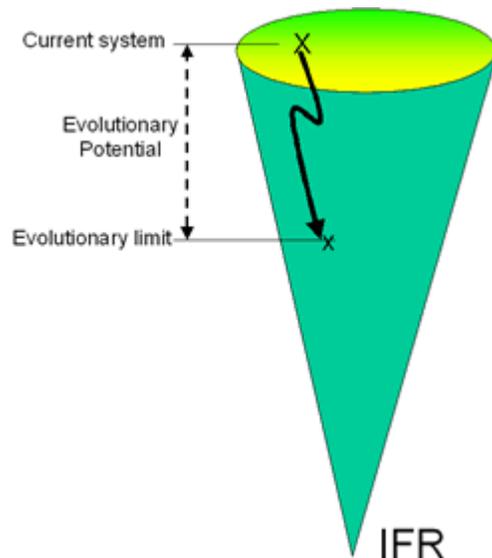


Figure 6: Connection Between Topographic Analogy, Evolutionary Potential and IFR

The idea of evolutionary potential (the untapped evolutionary possibilities if we take the current system and take it all the way along all of the TRIZ technology evolution trends) and the we can use up all of this potential from a given start point and not achieve IFR seems to encapsulate all of the previous ideas and thoughts regarding psychological inertia, the need to de-optimize sometimes, and the use of TRIZ solution triggers to find other places to start digging. It also serves to re-enforce the importance of starting from IFR and digging back up to the surface.

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