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Send them to darrell.mann@systematic-innovation.com
Raising The IP Mountain
(‘Inventing Beyond’ Competitor Patents)

The subtleties of the legal profession often appear a tad strange to those of us stuck on the outside of their world. So ‘designing around’ someone else’s patent is deemed ‘illegal’, while finding a ‘technical alternative’ is perfectly legal. Even though, to all intents and purposes, both end in the same result – a design solution that permits freedom to practice without having to pay any kind of license fee to the original inventor.

Speak to officials from the Patent Office, in the UK at least, and their somewhat different view is that patents are published in order to provide a record of who owns what, but also, perhaps more importantly, to define a ‘mountain of knowledge’ upon which other inventors are encouraged to build. Patents, in their terms, represent a record of ‘state of the art’. Future inventors are thus encouraged and expected to make use of this information to help invent future states of the art. Although the term is not one used by either profession, we might think of this activity as ‘inventing beyond’ an existing patent. Taken together with the lawyers definitions of ‘design around’ (illegal) and ‘technical alternatives’ (legal), Figure 1 presents a TRIZ/Systematic Innovation perspective on the actual differences between this trio of expressions:

As per our usual convention, the cone in the figure represents the convergent evolution path towards the Ideal Final Result state – deliver the FUNCTION with zero cost or harm – that drives all successful inventions. In our terms, ‘inventing beyond’ an existing patent means creating fundamentally more ideal solutions that raise the IP mountain. It means, when we have finished, not only do we have ‘freedom to practice’ with our new solution, but also that our new solution is superior to the original invention.

Conversely, ‘designing around’ a patent, in our terms, means that, although we have (illegally?) engineered a solution that we are free to exploit without infringing the competitor patent, it is less ideal than the original. Finally, a ‘technical alternative’ creates a (legal?) solution we are free to practice, and does it by switching from one way to deliver the function served by the original patent to another.

Having defined a terminology, the remainder of this article examines a process for systematically achieving the preferred of the three options on offer – ‘inventing beyond’.
Step 1 – Select Candidate Patent
Most likely the easiest step of the process. In our case, we have chosen an (almost!) random patent application from the US patent database. In your case, you need to start from what you think is a ‘best’ patent – something you would love to invent beyond.

United States Patent Application 20040196866
Kind Code A1
Park, Sang-Yong; et al. October 7, 2004

Method for transmitting and recording schedule using short message service

Abstract
Disclosed is a method for transmitting a common schedule message to a plurality of mobile terminals using a short message service (SMS) in a mobile terminal having an SMS function and a schedule function, and enabling a mobile terminal receiving the schedule message to record the received schedule message therein as a schedule. If a user selects a schedule transmission for transmitting a schedule registered in the mobile terminal to another mobile terminal, the mobile terminal converts a data format for the schedule into a data format of a schedule-recordable SMS message, and then transmits the schedule-recordable SMS message. To record a schedule, the mobile terminal receiving a schedule message converts a data format of the received SMS message into a format of schedule-recordable data and records the converted data therein as a schedule, if schedule recording is selected by the user.

Inventors: Park, Sang-Yong; (Seoul, KR); Jin, Jeong-Gyu; (Suwon-si, KR); Park, Hyun-Jin; (Seoul, KR)

Assignee Name SAMSUNG ELECTRONICS CO., LTD.

Step 2 – Patent Claim Genealogy
Since it is the Claims section of an invention disclosure that the lawyers will primarily rely on to determine whether a patent has been infringed or not, this is the place we need to start in order to conduct the ‘invent beyond’ activity. Key in this part of the process is identification of the independent claims contained within the disclosure. Here is an abbreviated list of Claims for our exemplar application highlighting the independent Claims:

1. A schedule transmission method in a mobile terminal having a short message service (SMS) function and a schedule function, the method comprising the steps of: (a) determining whether a schedule transmission input for transmitting a schedule recorded in the mobile terminal to another mobile terminal is selected by a user; and (b) if the schedule transmission input is selected, converting a data format of the schedule into a data format of a schedule-recordable SMS message and transmitting the schedule-recordable SMS message to said another mobile terminal.
2. The schedule transmission method of claim 1, wherein…
3. The schedule transmission method of claim 1, wherein…
4. A schedule recording method in a mobile terminal having a short message service (SMS) message reception function and a schedule function, the method comprising the steps of: upon receiving an SMS message, determining whether the received SMS message is a common SMS message or a schedule-recordable message; if the received SMS message is a schedule-recordable message, determining whether a schedule recording key is input; and if the schedule recording key is input, converting a data format of the received SMS message into a format of data recordable in a scheduler, and recording the converted data in the scheduler.
5. A schedule transmission method in a mobile terminal, comprising the steps of: (a) if a schedule message
transmission input for schedule recording to other mobile terminals is selected by a user, transmitting the
schedule message to the other mobile terminals; and (b) upon receiving the schedule message, recording
schedule information of the received schedule message as a schedule if a schedule recording input is selected
by the user.
6. The schedule transmission method of claim 5, wherein…
7. The schedule transmission method of claim 5, wherein…
8. The schedule transmission method of claim 5, wherein…
9. The schedule transmission method of claim 8, wherein…
10. The schedule transmission method of claim 8, wherein…
11. The schedule transmission method of claim 5, wherein…
12. The schedule transmission method of claim 11, wherein…
13. The schedule transmission method of claim 5, wherein…
14. The schedule transmission method of claim 5, wherein…
15. The schedule transmission method of claim 14, wherein…
16. The schedule transmission method of claim 14, wherein…
17. The schedule transmission method of claim 5, further comprising…
18. The schedule transmission method of claim 17, wherein…

Thus we see in this particular application, there are three independent Claims – 1, 4 and 5 – and 15 other Claims variously dependent on these three. A full Claim genealogy for the patent, showing how each of the Claims relates to the others is illustrated in Figure 2.

![Figure 2: Claim Genealogy For Exemplar Patent](image)

To ‘invent beyond’ this application, we thus need to focus first and foremost on the three independent Claims. Once we successfully invent beyond these Claims, we will, by definition, also have invented beyond the Claims which depend upon them.

**Step 3 – Claim Function Analysis Model**

Although many patent attorneys and lawyers might argue otherwise, because of their legal significance, Claims are not always written in the most readable form of English. For this reason alone it would probably be worth conducting this next step of the process. More important, however, is its value in helping us to connect to the various different strategies described in the fourth and fifth steps of the process.

The key to converting the legalese into a functional representation is relatively straightforward. We are interested in three different things:

1) Nouns – which will define the elements within a Claim
2) Verbs – which will define the functional relationships between the elements
3) Adjective (and other descriptive text) – which will define the attributes, if any, of the elements.

The only other thing we need to look out for then is whether the Claim under evaluation describes a process or method. If it does – as is the case in our exemplar – the fourth thing we need to look for are the various different steps of the process. In the case of Claim 1 of our exemplar, then, there are two steps to the method defined by the inventors,
a) a determining step, and, b) a converting and transmitting step. Figure 3, finally, illustrates the result of converting the Claim into a Function Analysis model according to our noun and verb rules:

![Figure 3: Function Analysis Model Of Claim 1 Of Exemplar Patent](image)

As per usual TRIZ convention, elements are drawn as boxes, and relationships are drawn as directional arrows between elements.

In this particular patent, there are no ‘attributes’ defined by the inventors. For the sake of completeness, then, here is another Claim sample from a different (again quasi-randomly selected) invention disclosure (US7,385,140 as it happens):

1. A grounding conductor characterized by comprising a conductive metal portion and a conductive casing portion that covers and contacts the conductive metal portion, the conductive casing portion having a specific resistance of 0.01 to 10 Ω.m; wherein said conductive casing portion is located at the outermost peripheral portion of said grounding conductor; wherein the entire outer surface of said conductive casing portion is in complete electrical contact with earth ground; and wherein said conductive casing portion is not surrounded by an outer sheath; wherein said grounding conductor is flexible so that it may be wound around a drum.

And Figure 4 illustrates the corresponding function analysis model:

![Figure 4: Function Analysis Model For Claim 1 Of US7,385,140 Showing Attributes](image)
Attributes, again as per our usual convention, are drawn as boxes attached to the relevant elements contained within the system.

In any complete ‘invent beyond’ activity, clearly, we will need to construct one of these Function and Attribute Analysis (FAA) models for each independent Claim. For the illustrative intent of this article, we shall stick with just the two models shown in Figures 3 and 4, and proceed to the next step of the process:

**Step 4 – Freedom To Practice**

In simple terms, generating a new solution that does not infringe on the original inventor’s Claim involves changing the FAA model in some way. In slightly more complicated terms, we need to be a little careful what we mean when we say ‘change’. ‘Changing the model’ by, for example, adding a new element or new process step, although it may create a new piece of intellectual property, will not deliver the ‘freedom to practice’ that we desire (we mention this direction since such pieces of new intellectual property may result from such actions). For our intended ‘freedom to practice’ solution, therefore, ‘changing the model’ essentially distils down to the following list of possibilities:

- take an element away
- (substitute an element with a substantially different one)
- remove a relationship connection
- change a relationship connection from one function to another
- transfer a relationship from one element to another
- change an attribute
- remove a process step
- change process sequence

Often the easiest of these strategies to apply is ‘change an attribute’. Many lawyers know this and try to avoid including such text in their disclosures. The inventor and their legal representatives are obviously minded to obtain the widest possible cover. The Examiner at the Patent Office on the other hand is intent on narrowing the disclosure as much as possible. Requesting the inclusion of constraining attributes is a good (or rather ‘simple’) way of achieving this narrowing effect (it may also be necessitated because other patents already define a different range of attributes). In the case of the Figure 4 Claim, there are various attribute descriptions, and thus a number of opportunities to create ‘freedom to practice’ solutions. Looking at the attributes outlined by the inventor, these would include:

- Don’t locate casing at outermost periphery
- Don’t have casing around ‘entire’ outer surface
- Non-flexible grounding conductor
- Resistance <0.01 or >10

The Samsung inventors from Figure 3 were able to avoid including any attribute descriptions in their Claim. Consequently, the ‘change an attribute’ option for creating freedom to practice is precluded. Of the other remaining strategy options, the most likely ways to achieve the desired freedom relative to the Figure 3 FAA model look like being:

- remove the ‘determine’ process step
- remove the element ‘user’ (i.e. no user select (automatic))
- eliminate ‘schedule data format’

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Although at this point any of these directions might, according to the letter of the law, create ‘freedom to practice’, we still have not created the ‘more ideal’ ‘invent beyond’ solution we ultimately desire. Indeed, more likely than not, any of the strategies thus far identified for either of the exemplar patent Claims are likely to create significant new ‘yes, but’ problems.

Fortunately, though, whenever we hear those two words, we know there are things we can do to overcome them. Which brings us to the fifth step in the process:

**Step 5 – Invent Beyond**

‘Yes, but’ means that we have just found a contradiction. In conventional TRIZ terms, a contradiction means there is something that we wish to improve in conflict with something that prevents us from making the improvement. In our current patent situation, the thing we are ‘trying to improve’ is the thing we need to do to create ‘freedom to practice’. The distinction here is subtle but important. We don’t, to take the US7,385,140 Claim as an example, necessarily wish to make the grounding contact inflexible from an ideality perspective, but it is one of our options from a ‘freedom to practice’ perspective.

If we stick with this example for a second, the ‘yes, but’ we have just created if we make the grounding conductor inflexible is that we can no longer wrap it around a drum. Not being able to wrap around a drum implies that storage and transport will be impaired. In turn this means that we will create either or both a volume or area problem. We have thus created a conflict between (inflexibility) Adaptability and Volume or Area. According, then, to the Contradiction Matrix tool, we are not the only people in the world who have had to resolve such a conflict. Figure 5 illustrates what the Matrix has to say about what these other people have done:

![Figure 5: Strategies For Resolving Adaptability versus Volume/Area Conflict](image_url)

It is beyond the scope of our intent here to present solutions to the conflict (although Principle 1, Segmentation, offers a fairly obvious clue to one possible direction). Rather the aim is to describe a systematic and reproducible process for doing the ‘invent beyond’ job.

By way of cementing that process, one of the ‘freedom to practice’ directions for the other exemplar patent Claim was removing the user from the schedule transmission input selection process. This direction would ‘improve’ Automation, but would cause the new problem of possibly sending erroneous transmission signals (the ‘yes, but’). Again, having defined this conflict pair, we are able to tap into the strategies used by others to resolve similar conundrums. In this case, the IT variant of the Contradiction Matrix is probably the more appropriate place to go and look. Figure 6 illustrates how this conflict pair is best mapped onto this tool:
Yet again, although the point is not to reveal actual – potentially patentable! – solutions, Principles 25, Self-Service, and 37, Relative Change both offer fairly straightforward opportunities to resolve the contradiction and to thus move in the desired ‘more ideal’ solution direction.

So much, then, for ‘inventing beyond’. We’ve done quite a bit of work by now (especially if we’re working with a patent with multiple independent Claims), but we haven’t quite finished. The next job requires us to head back to the patent databases of the world:

**Step 6 – Check**
Creating ‘freedom to practice’ and a more ideal solution than one piece of intellectual property, doesn’t necessarily mean that someone else hasn’t already done the same thing. By starting with a good first patent, we can certainly help make sure we’re in the clear, but we should go back to and at least check. ‘Good’ in the sense we mean here implies starting our efforts with patents that are as recent as possible. It also means finding patents that, in crude terms, we wish we’d thought of first. In essence, we’re looking to start with current ‘wow’ inventions.

If we’re unfortunate enough to discover that someone already invented our beautiful new solution, then our job – painful as it might sound – is to head back to Step 1 and to repeat the cycle. Being forced to do this job a couple of times is a great way to encourage you to get better at searching through the patent database. Which is a good thing, right? If only to provide more proof that inside every bad thing is a good thing waiting to get out.

If we’re lucky, or we get good at the job, and we find that our new ‘invent beyond’ solution is unique, we could declare the job finished at this point. That would be an okay thing to do. Especially if we have a friendly patent lawyer nearby who can take over the job of turning our solution into a shiny new patent application. An ‘okay’ thing to do, though, rarely stands up against the ‘best’ thing to do. The best thing to do in this case, would be to embark upon one final step in our process:

**Step 7 – Bullet-Proof**
Smart inventors seek to make their inventions invulnerable to the sort of attack by others described in the preceding six steps. One way to achieve this would be to take your precious new invention and run it through the steps anyway to see if you can invent beyond your own invention. If this sounds painful, it probably is. A far more appealing, and equally valid, thing to do at this point then would be to conduct an Evolution Potential analysis of your invention. The Evolution Potential analysis process is described in a context relevant to inventing technical solutions in both the Hands-On Systematic Innovation and Systematic (Software) Innovation books so we won’t repeat ourselves here.
The theory behind ‘bullet-proofing’ a patent using Evolution Potential as a guide is very simple:

a) Map where your current invention is along the relevant Trends, and then,
b) Draft Claims for each of the Trend stages not already included in your invention.

By way of a (partial) example, Figure 7 illustrates what the system-level Evolution Potential radar plot looks like for the US7,385,140 patent and our hypothetical ‘segmented’ successor.

![Figure 7: Evolution Potential Radar Plot For US7,385,140 And Beyond](image)

In this example, the plot indicates a substantial amount of untapped potential (around 70% according to the EvPot+ software). Any and all of the unmade jumps that can be translated into physically achievable (‘produce-able by one skilled in the art’ is the official patent office rule) solutions are candidates for inclusion in our list of bullet-proof Claims. The Space Segmentation Trend, taking one simple example to illustrate the point, is currently indicated at the ‘monolithic solid’ first stage of the trend. We can test whether this is the correct assessment by making a search of the US7,385,140 invention disclosure to see if the inventor has made any mention of ‘hollow’ or ‘multi-hollow’ or ‘porous’ elements in their disclosure. Since, in this case, that inventor did not make any mention of such jumps along the trend, it is something that we can ‘own’ as one or more dependent Claims in our new invention (‘…a conductor with at least one hollow portion…’).

Again the reality is rather more tedious and involved than the theory. The Figure 7 radar plot is merely the high level system plot and it includes 16 Trends. Meaning that we’re going to have to examine at least these 16 different evolution directions. More likely we’re also going to have to repeat the same analysis at the sub-system and super-system levels for the invention too. That’s what we recommend anyway. A typical ‘real’ exercise, in our experience, is likely to take one or two days. That’s a couple of days of ‘not having much fun’ (although there are ways to make an interesting game out of the job if needs be), but most likely a small price to pay for protecting the future of your business.

Here are those process steps again by way of a summary of how you’re hopefully going to do exactly that:

1) **Select Candidate Patent**  
2) **Claim Genealogy**  
3) **Claim Function Analysis Model**  
4) **Freedom To Practice**  
5) **Invent Beyond**  
6) **Check**  
7) **Bullet-Proof**

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Resonance And Rhythmic Entrainment As Resources

Resonance can be broadly defined as "the impact of one vibration on another." Literally, it means "to send again, to echo." To resonate is to "re-sound." Something external sets something else into motion, or changes its vibratory rate. This can have many different effects some subtle and some not so. The great thing about resonance, from a problem solving and innovation perspective, is that just about everything has a resonant frequency. Resonance is thus a potential resource in almost any situation.

Traditionally, however, this resonant frequency is viewed as something that needs to be avoided. Designers of any kind of rotating machinery, for example, know that rotating something at a resonant mode is a great way to cause a lot of damage in a very short amount of time. Noise and vibration engineers get to make their living out of mitigating the negative effects of resonance.

Resonance doesn’t have to be a bad thing though. Indeed, in true TRIZ, turning-lemons-into-lemonade fashion, just about any bad thing is also a good thing. The most obvious ‘good thing’ is that resonance allows us to turn a small input signal into a big output signal – Figure 1.

![Figure 1: Large Amplitude Outputs Achievable By Vibrating Close To Resonant Frequency](image)

Stripping paint from a surface with a pulsing water jet uses considerably less water than if a constant jet is used. Pulse the water at the resonant frequency of the surface, though, and that amount of water can be further reduced by up to an order of magnitude.

Likewise, the emerging field of sonochemistry exploits the resonant frequency of reactants to increase reaction times by, done correctly, several thousand times (Reference 1).

Resonance also has another, rather less well known, resource potential, ‘rhythmic entrainment’. This phenomenon was first observed in the 17th century. Entrainment is defined as the tendency for two oscillating bodies to lock into phase so that they vibrate in harmony. It is also defined as a synchronization of two or more rhythmic cycles. The principle of entrainment makes for another widely available resource because it can again be found in a wide range of different places, for example in chemistry, pharmacology, biology, medicine, psychology, sociology, astronomy, architecture and more. A classic example can be illustrated with individual pulsing heart muscle cells. When they are brought close together, they rapidly begin pulsing in synchrony. Another example of the entrainment effect, albeit working over a somewhat longer timescale, is women who live in...
the same household often find that their menstrual cycles will converge and eventually coincide.

The history of entrainment is linked to Dutch scientist, Christian Huygens in 1665. While working on the design of the pendulum clock, Huygens found that when he placed two of them on a wall near each other and swung the pendulums at different rates, they would eventually end up swinging in at the same rate.

The entrainment process is quite evident in music. The most common example of entrainment is tapping your feet to the external rhythm of music. Just try keeping your foot or your head still when you are around fun, up-tempo rhythms. You will see that it is almost an involuntary motor response.

Dig a little deeper (Reference 2 for example) and the world of rhythmic entrainment also branches into melodic entrainment and dynamic entrainment. So called ‘entrainment music’ created by taking into account these phenomena has the potential to significantly alter mood and mental state. Certain sounds, in specific sequence can help bring the listener from one place to another. This process is also known as the “isoprinciple.”

Entrainment, in the context of psychoacoustics, concerns changing the rate of brain waves, breaths, or heartbeats from one speed to another through exposure to external, periodic rhythms. When the brain is presented with a rhythmic stimulus, such as a drum beat for example, the rhythm is reproduced in the brain in the form of these electrical impulses – Figure 2. If the rhythm becomes fast and consistent enough, it can start to resemble the natural internal rhythms of the brain, called brainwaves. When this happens, the brain responds by synchronizing its own electric cycles to the same rhythm. This is commonly called the Frequency Following Response.

To date, this ‘free’ Frequency Following Response resource has barely begun to be exploited by inventors and problems solvers (searching the term ‘rhythmic entrainment’ on the US patent database reveals less than 20 relevant patents for example). As such, it is our contention that there is tremendous untapped invention potential here for a whole host of different application areas.

References
1) http://www.scs.uiuc.edu/suslick/britannica.html
No-one likes a party pooper. But sometimes lines have to be drawn. Esteemed author and researcher, Roger Straughan recently crossed the hazy line between harmless story and exploiting the gullible. And so, Dr Straughan, in the interests of science we conducted an experiment for you.

The good doctor stood up at a recent well-attended Arthur Conan Doyle seminar and announced that the late ACD was communicating with him from beyond the grave. Now, I like to keep an open mind on these kind of things, so I managed to shackle myself to my seat and listen through his hour-long story.

That story goes something like this. A few years ago, poor Dr Straughan’s pet dog died. In a fit of remorse over could he have done more to make the animal’s last days more comfortable, the doctor picked up a book of Conan Doyle short stories laying on his bedside table. He then opened the book at a random page. The first thing that grabbed his attention on the random page was a message – from Conan Doyle he later concluded – to the effect that the dog had been very comfortable, thankyou very much, and that the doctor had no need to feel any kind of guilt.

Following this highly compelling and uncannily believable communication with the other side, Dr Straughan began to make a habit of consulting Conan Doyle on a host of other topics. The method of consultation essentially involved selecting a random tome from his shelf of ACD literature, opening to a random page and seeing what text drew his eye. ‘Amazingly’, the doctor announced to the conference audience, ‘the response he received invariably proved to be insightful and accurate’. (Actually, in an off-hand comment towards the end of his presentation, he admitted that the hit rate was about 25%, but alas the book version of his story – published later this year, para-psychology fans – sounds like this admission will be omitted.)

Now it turns out that Dr Straughan is something of an esteemed academic. Here’s his bio:

“Roger Straughan’s career has been spent teaching in schools, colleges and universities, culminating in his holding the post of Reader in Education at the University of Reading, UK, specialising in the philosophy of education. He gained an MA and Ph.D (London) in that subject, together with an MA in Classics (Cambridge). His university research has led to the writing and editing of many books and articles on issues in education, philosophy and ethics, and he has given invited papers at many international conferences.”

This seemed quite strange to me when I first read it after the conference had finished. How can someone with such an apparently impressive academic background come to the conclusion that Arthur Conan Doyle was talking to him from beyond the grave? Had he cross-calibrated with other dead authors I wondered? Was there, in other words, any kind of real science happening here.

I decided to find out.

Alas, I don’t possess any Arthur Conan Doyle books. Alas too, there aren’t many authors that I own lots of books by. Fortunately, there was one. And moreover he was dead. Here, then, is my Bukowski shelf:
So, following Dr Straughan’s method to the letter, I ran my finger along the shelf until I could feel Bukowski’s presence telling me which book to chose. The book I pulled from the shelf turned out to be Screams From The Balcony, Selected Letters 1960-70. I then opened the book at random (still feeling Buk’s influence somewhat). The page turned out to be 295. My eyes scanned the page for a fraction of a second, and, whoah, I read the following:

’god damn, Hank, you’re really full of BULLSHIT!’

Wow. Amazing. He even wrote with capital letters made it so very easy to focus on what he was trying to say. The Buk’ster was really in the room with me. I could, in fact, sense him whispering in my ear. ‘Try me again’, he said. So I did. This time the ‘randomly’ chosen book turned out to be Dangling In The Tournefortia. And the ‘random’ page number was 265. Again, my eyes scanned the page:

‘the people are so used to being conned’

Holy cow. By now I can practically smell Buk’s alcoholic breath wafting over my shoulder. But I know the guy pretty well, and I know he doesn’t want me to trust him. I think he wants me to test my ability to talk with other people living in the beyond. A tougher test.

After a few moments deliberation, I decide that my vinyl record collection is the longest ‘shelf’ I possess. Several thousand albums worth of shelf in fact. And with most of the artists dead or dying. I approach the shelf focusing on the question, ‘is Dr Straughan really talking to the other side just like me?’ and I let my fingers run along a row of records.

The one I pull out indeed turns out to be by someone dead, Duke Ellington. The album was called ‘Money Jungle’. Interesting, but not so conclusive as Bukowski. On the other hand, it was an instrumental album, which seemed to be symbolic in some kind of way – no-one was saying anything. All I had to go on in fact was the track listings. I glanced through them, and – kaazaaam – the word ‘Solitude’ boomed out at me. Sir Duke, too, was clearly in the room with me. Dr Straughan, I start thinking, I take it all back.
Time for one final piece of scientific analysis though before I place my order for the Straughan’sters book. Does this stuff work with live authors too?

I supposed at this point that emailing live authors might be a more solid way to proceed, but for the purposes of true back-to-back comparison, I made a random selection of my business book in-pile. Say hello to Harry Dent and his latest non-epic ‘The Great Depression Ahead’. The random page this time was 23. And the first thing I noticed on the page, highlighted in quotation marks was:

“the three bears”

Which I took to be an indication that Mr Dent was trying to tell me that the Straughan story was a work of fiction.

By now I’m totally convinced. So much so, in fact, I’ve decided to live the rest of my life only listening to Bukowski, Ellington and Dent. Okay, strike Dent, but Bukowski sounds kind of cool to me. Forget Straughan’s ‘25% success rate’ with Arthur Conan Doyle, Bukowski – maybe because he died more recently and is therefore not so far into the beyond – has been giving me a substantially higher hit rate. Admittedly, thanks to my now-regular consultations, I have been forced to go and get a job at the Post Office, lose lots of money gambling and drink a bottle of Scotch a day, but all in all that seems to be a pretty small price to pay for the ability to channel from across the great beyond.

You should try it too. Maybe even buy Dr Straughan’s book when it comes out later this year. ‘Study In Survival’ will be published by ‘O’ Books in November. Available from all good book stores.
Patent of the Month – Face Detection

The patent this month concerns the problem of face recognition in security cameras. The patent is awarded to a multi-national team of inventors working for Siemens:

United States Patent 7,542,592

Systems and methods for face detection and recognition using infrared imaging

Abstract

Methods for image processing for detecting and recognizing an image object include detecting an image object using pose-specific object detectors, and performing fusion of the outputs from the pose-specific object detectors. The image object is recognized using pose-specific object recognizers that use outputs from the pose-specific object detectors and the fused output of the pose-specific object detectors; and by performing fusion of the outputs of the pose-specific object recognizers to recognize the image object.

Inventors: Singh; Maneesh (Plainsboro, NJ), Okada; Kazunori (Plainsboro, NJ), Bascle; Benedicte (Lannion, FR), Comaniciu; Dorin (Princeton Jct., NJ), Baratoff; Gregory (Regensburg, DE), Kohler; Thorsten (Deuerling, DE)

Assignee: Siemens Corporate Research, Inc. (Princeton, NJ)
Siemens Aktiengesellschaft (Munchen, DE)

The background section of the disclosure offers a very concise perspective on the problems associated with face recognition:

Face detection and recognition (Ability to detect) is potentially a very useful tool in applications such as surveillance and access control. The goal is to identify a face from an input image or a video stream and to register it with a face database. Such a task is challenging due to various reasons. First, authentication requires extremely low false alarm rates and high detection probability simultaneously (measurement precision). Second, these applications need to use high quality cameras and complex algorithms that require significantly large amount of computational resources (amount of information). Third, face images cannot always be captured in controlled imaging conditions with constraints specified on face orientation/position (angle of moving object), lighting condition (illumination intensity) and background clutter (amount of information). Real-time, uncontrolled, outdoor conditions in which the above applications are expected to perform imply challenges in the form of highlights and glare due to the sun, day/night variations, night lights, weather conditions, head movement (speed), complex background, moving background, etc. Image variations due to these factors make the face detection and recognition task more difficult.

Here’s what the Contradiction Matrix has to say about such combinations of conflicts:

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And here then is how the inventors summarise their invention, with interpretations of the various Inventive Principles that can be elicited from their description:

*Face detection using components offers superior results due to its robustness to occlusions, pose and illumination changes. A first level of processing is devoted to the detection of individual components (1, Segmentation), while a second level deals with the fusion of the detected components (5, Merging). However, the known fusion methods neglect the uncertainties that characterize the component locations. These uncertainties carry useful information that could lead to increased face localization accuracy (3, Local Quality; 37, Relative Change).*

*Infrared light has a much longer wavelength than visible light. The longer wavelength of infrared light allows it to penetrate objects that visible light cannot. Using infrared light (35, Parameter Change) to illuminate faces would allow for better component based face recognition as it implies robustness to variations in the image due to ambient lighting and surface texture.*

*Exemplary embodiments of the present invention relate to image processing, specifically to detecting and recognizing faces using infrared imaging and processing. According to one exemplary embodiment, a method for image processing for detecting and recognizing an image object include detecting an image object using pose-specific object detectors (1, Segmentation; 10, Prior Action), and fusing the outputs from the pose-specific object detectors (5, Merging). The image object is recognized using pose-specific object recognizers (24, Intermediary) that use outputs from the pose-specific object detectors and the fused output of the pose-specific object detectors; and by fusing the outputs of the pose-specific object recognizers to recognize the image object.*

All in all an extremely concise and elegant invention disclosure document. Also interesting in the unusually high density of illustrations of the Inventive Principles. Well worth a read through the whole disclosure irrespective of whether you are interested in the subject or not.
Best of the Month - Fundamental Design Method

We’re going to be very unfair this month because your chances of getting hold of a copy of Fundamental Design Method, by the late Edward Matchett are pretty slim. The book – a culmination of a life’s work – has unfortunately been out of print for some years now. Which is such a terrible shame, we’re taking it upon ourselves to do something about it.

Here’s an excerpt from Matchett’s foreword to the book to give you a flavor of why it is important and how it form some positive links to the Systematic Innovation story:

So how did I come to put this discipline together? … … When I first started teaching at The West of England Employers Association College in Bristol in 1960, I had left the ‘cosy’ environment where I had taught in The Propulsion Department and later the Management School of The College of Aeronautics, Cranfield (now Cranfield University), and began teaching professional engineers. This change came as quite a shock as I had to put myself in my students’ place and share with them the knowledge and training that I had received as a Professional Rolls-Royce Aircraft Designer and all that I had learnt and taught subsequently at ‘The College of Aeronautics’.

One of the main obstacles in doing this was that I found that a few of my ‘professional’ students didn’t want to think or had stopped/slowed down their thinking and needed, again, the discipline and shaking I had received as an apprentice and Designer at Rolls-Royce, Derby. Remembering back I had the image of my section leader/supervisor/chief designer criticising or tearing up work that I had done – saying “That it won’t work!” Never saying ‘why’ … that was my problem. Many frustrating hours later after thinking, checking, re-thinking and re-checking I would find the answer and each time it happened I ‘grew’. It was a very hard way of learning but at the end you were – and knew you were – ‘A Professional’ - completely in charge of yourself and your work … and being trained at Rolls-Royce with their very high standards you knew you were among the best.

The Fundamental Design Method (FDM), then, evolved over the twenty year period from 1952 to 1972. FDM was designed ‘to enable very complex problems to be solved and scientific, technological and other breakthroughs to be procured whilst lifting individual development and thinking capability to a much higher level’. Sound familiar?

If not, check out one or two of these quotes from the main content of the book:

“So what is Fundamental Design Method - what does it do and how does it work?

➢ It is a meta-system (change-system); tuned to produce the optimum solution to the sum of the true needs of a particular set of circumstances.
A logical, co-ordinated, systematic approach focused on obtaining good design (appropriate form) in any area of technology or other creative work.

A series of related and interlocking mental tools, which can be coupled in the mind in a variety of ways and used by technologists or executives at any stage of designing, or management decision making, to any desired utilisation and degree of penetration.

A formalisation of the most basic and universal philosophies, principles, processes, disciplines and attitudes that mature creators in all fields must instinctively employ to co-ordinate and apply relevant knowledge when working effectively and efficiently.

When Matchett refers to ‘the optimum solution’, he is referring to ‘the optimum solution to the Sum of the True Needs of the particular set of circumstances’. It is, in effect, a master control equation, the end-point for which consists of…

…two further control concepts – those being zero and infinity - perpetually active in all one’s thoughts and actions. Thus the mind that is being tuned to master the discipline of FDM is always being confronted with the extreme challenge in one or the other – or both – of these absolutes. All work processes, time-measured-on-a-clock, costs, materials (or special ingredients) all undesirable events and practices that have seemed unavoidable must somehow be reduced to zero – or at the most to an infinitesimal shadow of what they would have been. … Also all desirable effects, rewards, profits, qualities, breakthroughs, reconciliation or meaningful experiences shall somehow be made to move into, or close to, that other ideal goal of infinity.

Hmm. This is 1952 remember. Ideal Final Result anyone? The following might also resonate with one or two readers:

![Figure 3](image1.png)  ![Figure 5](image2.png)

There is so much richness and content that either overlaps, re-enforces or in some cases supplants the some of the core concepts of TRIZ that it’s a terrible, terrible shame that this work has been allowed to disappear from view. Seriously, some of this material is a considerable way ahead of some of Altshuller’s thinking. It’s definitely, too, not always an easy read, but, hey, when did that ever stop anyone in the TRIZ community from advancing their knowledge?

What starts today, then, is a campaign to get the work back out in the world and readily accessible to TRIZ aficionados and creative problem solvers alike. Anyone interested in finding our more might like to get in touch with Darrell.
The Ministry of Science, Technology and Innovation (MOSTI) in collaboration with the Malaysian Industry-Government Group for High Technology (MIGHT) organised another annual round of TechnoMart Malaysia from 4th to 5th June 2009. The purpose of the event was to promote technology partnering and trading activities of homegrown technology and Intellectual Property.

The highlight of the event and symbol of its importance was an opening keynote address by Y.B. Tuan Haji Fadillah Yusof, Deputy Minister of Science, Technology and Innovation of Malaysia.

Following that, in a somewhat surreal moment, members of your illustrious Systematic Innovation team were whisked up on the stage shaking the Minister’s hand and made to act out a ceremonial Exchange of Commercialisation Agreements. Apparently our humble collaboration activities were government-minister worthy. (The Government is sponsoring one of our research proposals – ‘CAP-Gen’ – and this turns out to be one of the only current examples of Malaysian companies making research deals with international companies. To say we were overwhelmed by the attention was probably understatement of the year. To us, the research proposal is just another drop in the Systematic Innovation ocean, and very definitely not something worthy of prime time TV. Perhaps we are underestimating its significance? Time will tell.)

Next up after us was an invited address “Making IP Strategy Work in Challenging Times” by YBhg Dato’ Kamal Jit Singh, CEO, Global Research Innovation. Dr Singh is a renowned innovation speaker and is clearly in vogue in Malaysia (the Dato’ prefix is the Malaysian equivalent of a knighthood in the UK). For us the presentation theme was a little bit dangerous – in a nutshell, Malaysia has to focus on high-tech research – but the audience of around a hundred members of the great and good from the country’s academia seemed to lap it up. Here’s hoping the words don’t come to cause some serious damage to Malaysia in the difficult next ten years.

As if to contrast with Dr Singh’s words, and really as a bit of fun, we also decided to stay on at the rest of the event, and joined the twenty or so academics invited to give a ten minute sales pitch for their research. Given that our presentation was for a humble hairdryer invention, while they were presenting things like nano-technology filters, digital fish-stock counters and chromium-eating-bacteria, we certainly felt like we were the only people flying in polar opposite direction to ‘high-tech’. Interestingly though, we seemed to be the only people the venture capital companies in attendance wanted to talk to afterwards. Hmm. A symbolic message we wonder? No doubt the next ten years – or hopefully two or less in the case of our ‘hairdryer 2.0’ commercialisation plans – will tell whether the high tech route is the only route to financial success.
Investments – Bacterial Cellulose Nanofibres

Nanofibres of pure cellulose can be made from bacteria that live on food waste and extrude them as mats. The fibres are very stiff and, although nobody seems to have measured the strengths of individual fibres, they are likely to be very sturdy.

Researchers around the world have, for more than a century, been studying bacteria that produce cellulose. However, development has now reached the point where first products are being produced commercially and a major breakthrough has just been achieved in producing the material in a useful form on an industrial scale, at much lower cost. The first mainstream engineering industrial applications are likely to be in filtration, closely followed by composites, but potential applications are being studied in industries ranging from wound care to cosmetics.

Emiliano Bilotti, research assistant in the Department of Materials at Queen Mary, University of London, at the recent Interplas Show, showed that the bacteria live on sugars, fruit juices and waste from the fruit industry. “They expel very highly crystalline cellulose fibres,” he explained. And, whereas cellulose from wood and plants contains a multitude of things, cellulose from bacteria is very pure. Typical fibres are tens of nanometres across and about 0.5 micrometres long.

More than one type of bacterium produces cellulose, but the species that has been most studied is Acetobacter xylinum, which extrudes glucan chains from pores on its sides into the growth medium. These aggregate into microfibrils, which bundle to form microbial cellulose ribbons. Some strains of the bacterium are much better than others in producing useful material, both in terms of production quantity and quality of end product. Pure crystals of cellulose, according to articles published by other researchers at Queen Mary, have a Young’s Modulus of 130 to 150 GPa and a tensile strength of 10 GPa - about three times that of Aramid Fibre. To be useful in bulk, however, there has to be some interaction between individual fibres, either in sheet form, spun together or used as reinforcement in a matrix of something else.

Meanwhile, Dr Ida Idayu Muhamad, a senior lecturer in the bioprocess engineering department at the Universiti Teknologi Malaysia in Johor, has taken the production process several stages farther. She has developed a novel rotary disk reactor, plus dryer, to produce the material on an industrial scale at lower cost and with lowered water content. The UTM professor was recently at the British Invention Show, where she
revealed she is working with pineapple waste, which represents 80% of the total material after the juice has been extracted. The breakthrough in production technology is important, because the device increases production yield, reduces labour requirements and is “easy to scale up”, she said. The basic idea is inspired by rotating biological contactors, used in wastewater treatment. It employs rotating disks that alternately soak the organisms in nutrient and expose them to air. In the re-engineered design, it is able to reduce water content by heating. The process is also reported to work well with a number of other fruit juices and fruit processing wastes and the production. As well as being faster than traditional tray growing methods, reducing production cycle time to seven days, the yield of useful product is tripled. Her methodologies are already attracting interest from one pineapple canning company.

Apart from filters and composites, applications are seen in food industries, healthcare and pharmaceuticals, cosmetics, textiles, wound care, skin cream, repairing antique documents and artificial leather. In particular, it is seen as having potential for use as artificial skin, artificial blood vessels, liquid loaded medical pads and speciality membranes, because of its inherent biocompatibility and biodegradability. Potential markets for the material produced as pellets in air-agitated cultures - which seems to be the favoured production method in Japan - include: the mining industry, the oil industry, foods, and the pulp and top-end paper industry. If it could ever be made cheaply enough to be supplied as film for plastic supermarket bags, it would allow everyone to use them again with a clear conscience.
Generational Cycles – Joan Of Arc And Baby Bust Generations

According to Strauss & Howe, generational cycles oscillate between boom and bust periods. Prophet generations (e.g. Baby Boomer generation born ~1945-62) tend to be the biggest boom in their four-generation cycle, with the Hero generation (Generation Y being the latest example) forming a usually slightly smaller ‘echo-Boom. The Artist and Nomad generations that divide these two Boom periods represent periods of ‘Baby-Bust’. The Generation X Nomads, for example, represent a generation with, in the US at least, 40% less members than Generation Y.

Identifying an alternating boom-bust cycle in the demographic records within a country is relatively easy, since pretty much every nation state conducts regular census evaluations of who is living within their borders and how old they are. What is less easy to find are some of the spin-off effects of these boom and bust cycles. Here, then, is a pattern we stumbled on pretty much by complete accident during a search for evidence about changes in gender differentiation across the generations.

The picture looks at film-makers periodic fascination with one of the greatest female heroes of the ages, Joan Of Arc:

Essentially, since the emergence of film, there have been three periods when Joan Of Arc movies have been made:

1) A period from 1908 when, first, French, then Italian and finally Hollywood filmmakers tried to tell the story (Cecile B. DeMille’s ‘Joan The Woman’ from 1917 serving as the creative peak).
2) A new cycle of films began again in 1948 with Ingrid Bergman taking on the title role in ‘Joan Of Arc’. This cycle ended in 1957, with Otto Preminger’s classic version ‘Saint Joan’.
3) Another new cycle of interest in the films started up again with a round of TV films and finally, Luc Besson’s hyper-real blockbuster ‘The Messenger: The Story Of Joan Of Arc’ again closing out the cycle in 1999.

Spot a pattern anyone?
Not to imply that Joan Of Arc is in any way responsible for baby-busts. If anything, coming at the end of each bust cycle, she is more likely acting as a call to arms to have more babies. Or something like that. Anyway, we’ll leave you to ponder on the thought. And no doubt you can start looking forward to the next new round of blockbuster re-makes in, oh, around the mid 2030s.

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Biology – Vaccinia Virus

Viruses use various tricks and disguises to invade cells. ETH Zurich researchers have recently discovered yet another strategy used by viruses: the vaccinia virus disguises itself as cell waste, triggers the formation of outgrowths in other cells and is suspected to enter the cell interior before the immune defense even notices.

The vaccinia virus has a problem: it is a giant among viruses and needs a special strategy in order to infiltrate a cell and reproduce. Professor Ari Helenius and Postdoc Jason Mercer from ETH Zurich's Institute for Biochemistry have now discovered what this strategy is. In the process, they stumbled upon new and surprising findings.

The invasion strategy
In order to infiltrate a cell, the vaccinia virus exploits the cellular waste disposal mechanism. When a cell dies, other cells in the vicinity ingest the remains, without needing waste disposal experts such as macrophages. The cells recognize the waste via a special molecule, phosphatidylserine, which sits on the inner surface of the double membrane of cells. This special molecule is pushed out as soon as the cell dies and is broken into parts. The vaccinia virus itself also carries this official waste tag on its surface. "The substance accumulates on the shell of vaccinia viruses", Jason Mercer explained.

The pathogen disguises itself as waste material and tricks cells into digesting it, just as they normally would with the remains of dead cells. As the immune response is simultaneously suppressed, the virus can be ingested as waste without being noticed.

The uptake into the cell itself is via macropinocytosis. The ETH Zurich researchers have demonstrated that the vaccinia virus moves along actin-rich filamentous extensions towards the cell. As soon as they impinge upon the cell membrane, an outgrowth (evagination, or ‘bleb’) forms. The virus itself is the trigger for the formation of the evagination. Using a messenger substance to "knock on the door", the virus triggers a signaling chain reaction inside the cell so that the bleb forms, catches the virus and smuggling it into the cell.

Proteins as unsuspecting allies
"The viruses are the Trojan horses that want to enter Troy; the Trojans are the many proteins that transmit the signals and open the 'city gates' to the unwelcome guest", Ari
Helenius said. Aided by Professor Lukas Pelkmans’ team, Jason Mercer examined over 7000 different proteins in order to find out not only which Trojans let the virus in, but which are also involved in the supply chain. Using definitive methods, the researchers deactivated each one of the suspected proteins to examine their function, and narrowed the vast number of proteins down to 140 potential culprits. The enzyme kinase PAK1 turned out to be an especially "helpful" citizen of Troy. Without PAK1, the pathogen’s trick did not work and the cell did not form any evaginations.

Until now, very little has been known about the mechanism vaccinia viruses use to infiltrate a cell. Professor Helenius, whose research objective is to find out what methods and strategies various different viruses employ to invade somatic cells, clarified “This strategy is a new one”. Other viruses, such as herpes, adeno and H1 viruses use macropinocytosis. However the vaccinia virus is the first one identified that uses apoptotic mimicry as an entry strategy.

Knowledge of the virus strategies and the signal proteins involved in the ingestion of a virus by a cell is crucial to finding and developing new agents against the pathogens. Until now, antiviral medication has targeted the virus itself. Ari Helenius, however, is looking for substances that interrupt the signaling chain and halt the communication between the virus and the cell. If the cell does not ingest a virus, the virus cannot reproduce and is quickly eliminated by the immune system. This process also has another big advantage: "Viruses cannot adapt to the obstruction of the signal chain all that quickly", he said.

The Contradiction
The clue to the problem vaccinia has overcome comes near the beginning of this description, taken, by the way, from a recent issue of Science: ‘it is a giant among viruses and needs a special strategy in order to infiltrate a cell and reproduce’. Here’s how we can best map that conflict onto the Contradiction Matrix:

Although described as a ‘Trojan Horse’ strategy, actually, vaccinia tricks its way into a cell by adopting an Intermediary (Principle 24), in this case, phosphatidylserine. This ‘apoptotic mimicry’ (fantastic expression!) means a cell is unable to differentiate between the ‘scent’ of the vaccinia over that of a recently dead cell it is okay to ingest. By disguising itself in this way, vaccinia is in effect reducing the tension (Principle 12) that would otherwise identify it as a harmful threat.

Good to know that the Trojan Horse strategy gets deployed at the molecular scale as well as the macro. Especially if its discovery allows bio-chemists to begin adopting more effective means of stopping the virus from doing harm. Far better to stop the Horse from being built than to attack the Trojans directly.
Short Thort

“Innovation is…
escaping one more box than your competitors”

News

Certification Workshops
We are pleased to announce a new round of public certification TRIZ/SI workshops will take place at our Clevedon office. The Basic and Intermediate level workshops will be on 26-27 October and 26-27 November respectively. The Advanced level workshop marking the end of the previous round of workshops will take place on 3-4 September. Details, as ever, on the Experience page of the website.

Anyone interested can now follow Darrell on his travels via twitter. Make the connection via the website homepage or at twitter.com. darrellmann is the name to look for.

Electrification of the IC Engine
We will be presenting a short exposition on the application of TRIZ/SI to this important automotive subject area at an IMechE event to be held on 16 September. The venue has still to be finalized, but will probably be at the Institute HQ in London.

SIBL
We will be conducting a 1-day ‘understanding populations’ workshop at the Scottish Institute for Business Leaders monthly event. Quite possibly too late if you’re reading this, the session takes place on 30 June in the fair city of Edinburgh.

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China IP Workshop
We will be presenting a half day introductory ‘bullet-proof IP’ workshop in Beijing on 19 August. Details on the Experience page of the website.

New Projects
This month’s new projects from around the Network:
   Telecom – IP valuation study
   Government – technology strategy study
   Food – workshop series
   FMCG – eyes on the world
   Oil/gas – workshop series and problem solving facilitation sessions