The Hybrid Invention Generator — Assorted Relations
Bill Seaman
Gideon May — programmer
Funded by Intel

Description of the **Hybrid Invention Generator**

A computer-based language system exploring hybrid invention generation has been developed by Seaman working in conjunction with the programmer Gideon May. Initial research was undertaken by a team from UCLA including Daksh Sahni – Architecture; Gustavo Rincon –Architecture; Kalim Chan – Design | Media Arts; Grace Tsai — Architecture; Craig Chun — Design | Media Arts and consultant Kostas Terzidis, PhD – Assistant professor in Architecture; with Seaman functioning as principle investigator. The project was primarily funded by Intel. This work explores 3D visualization with related generative texts and recombinant audio/music, as well as a series of textual descriptions. Computer-based environmental meaning is explored through the inter-authorship and operative experiential examination of a diverse set of media-elements and media-processes, in this case focusing on the virtual construction of hybrid inventions. Differing sets of media-elements in The **Hybrid Invention Generator** convey their own fields of meaning through the juxtaposition of 3d models, texts and digital audio. Varying combinations of these fields of meaning are experienced through direct interaction with the system. Each participant will potentially have a different experience of this open work. Umberto Eco wrote this observation in his text The Open Work:

> A work of art is a complete and closed form in its uniqueness as a balanced organic whole, while at the same time constituting an open product on account of its susceptibility to countless different interpretations which do not impinge on unadulterable specificity. Hence every reception of a work of art is an interpretation and a performance of it, because in every reception the work takes on a fresh perspective for itself.
>
> Nonetheless, it is obvious that works of those like those of Berio and Stockhausen are "open" in a far more tangible sense. In primitive terms we can say that they are quite literally "unfinished": the author seems to hand them on to the performer more or less like the components of a construction kit. (Eco, 1989, pp.3-4)

The active participation of the user of the **Hybrid Invention Generator** is primary. The user of the system explores a polyvalent computer-based "construction kit". The mind-set of the participant represents an active field in that the work is highly associative in nature. The participant becomes dynamically involved in the construction of inventions as well as in the construction of emergent meaning. It is through the combination and recombination of evocative digital fields of meaning, as experienced by an engaged participant, that a new form of poetics that I call Recombinant Poetics (see Seaman, 1999) can be explored. We can also listen to this work as a particular space for the exploration of musical combinatorics and as an example of a sonic form of invention generation.

The **Hybrid Invention Generator** functions via a touch screen interface and projection system. Two scrolling sets of inventions are presented as stills of 3D objects authored by Seaman. One can move this "train" or "conveyor belt" of inventions and observe differing devices. Each invention has a specific authored database, providing additional information related to a set of potential ways of understanding these devices in terms of "Input", "Functionality" and "Output".

The user of the system can select a particular “invention" by toughing the screen. A single invention is then presented on half of the screen, under the selection “train”. This invention appears as a 3D model that can be oriented in space by the participant. The user now selects a second invention/object from the alternate menu. Once the second invention is chosen, a juxtaposition of the two inventions is presented—one on the left side of the viewing screen, a second on the right side. A repetitive audio track accompanies each invention and changes as each different invention is viewed.

An elaborate set of "Conjunction Codes" have been developed that suggest differing ways of bridging the output of one invention with the input of the other device. A black box model for each invention has been developed — input + functionality = output. The conjunction codes suggest differing ways that the output from one device could be translated into a form that could functionally become the input of the 2nd device. These conjunction codes are called upon to describe the functional connection between the two chosen inventions. These descriptions lend an operative logic to the system, transcending a merely formal/aesthetic intermingling of the inventions. Sometimes highly suggestive of a workable device, while other times more humorous or contemplative in nature, the "conjunction codes" provide an interesting field of association for the participant. They are presented at the bottom of the screen after the participant selects the “generate” button. These lines of text are run together, and in a literal/poetic manner reflect the merging of the two chosen devices.

The underlying logic of the conjunction codes, functioning in conjunction with the black box model, suggests that particular generated hybrid inventions could actually be built based on the operative metaphors in the work. A code-based template has been constructed in a bottom-up manner to facilitate logical searches lending intelligence to the "Conjunction codes". This elaborate intelligent template can also be employed as new devices are added to the system in subsequent iterations.

Thus, the participant observes both the design of the hybrid provided through visualization, a list of key "input", "output" and "functionality" descriptions for each device (presented in a compressed poetic form), as well as the textual description of how the hybrid could be derived in an attached subtitle. The co-mingled names of the devices are also provided after hybrid generation. The user of the system can also select the percent of parentage of each device. This effects how the visualization will appear. One can view a series of snapshots of different parentage percentages and choose between 10%, 20%, 30%, 40%,50%,60%,70%,80%,90% to derive different visualizations i.e. 10% of one device co-mingled with 90% of the other provides a particular visual outcome. This is achieved through an "on the fly morph" technique developed by the programmer Gideon May for this project. This morph technique will be elaborated by May in a subsequent paper. Propritary software was written in c++ and for the project. Seaman

provided the conceptual framework for the generator, the textual designations and the media elements that populate it.

When the user of the system generates a hybrid media-object, the initial "Black Box logic" is transgressed. The new formula might read: Input + functionality = Output; where this output is then translated into an augmented or different form to become the input for the second device; subsequently it is suggested that the second device's output is transformed through the qualitative changes brought about through this augmentation/change as visualized in a particular percentage of parentage. Thus, this machinic assemblage takes on a life of it's own.

There are many different perspectives defined in the textual observations that accompany each invention exploring in an expanded manner the notion of "input", "output" and "functionality". These descriptions can be technological, body related, social, physical etc. The participant can use these text designations as a field of associative meaning to inform their "understanding" or personal conceptual perspective or orientation to the selected device. These choices also affect the search mechanism that seeks the appropriate "conjunction codes". Thus for each device a textual designation of "input", "functionality" and "output" informs the operation of the system, and in part functions as an associative vehicle providing multiple fields of meaning.

Nonsense and Logic

By *loading* the **Hybrid Invention Generator** with specific qualities of media as well as a highly developed underlying logic, I embrace the mindful exploration and relevance of nonsense and play as well as logic and sense. This is pivotal to the *poetics* of my earlier work with Gideon May, The World Generator / The Engine of Desire. I examine through technological means the peripheries of meaning— The complexities of meaning production are experientially engaged by an active participant. The participant brings their mindset related to concepts of functionality, input, and output, the normal use of particular inventions and the devices displacement through this combinatoric system.

Nonsense relations can present seemingly off-kilter juxtapositions, providing the participant with an experience akin to surrealism. Lautréamont's definition of surrealist beauty — "beautiful as the unexpected meeting, on a dissection table, of a sewing machine and an umbrella," (Waldberg, 1965) — describes an experience engendered through a unique juxtaposition of elements not unlike relations encountered within this particular techno-poetic environment. Here we move to a superimposed conceptual | actual machine that directly explores functionality as well as a paradoxical functionality/dis-functionality. Stewart in *Nonsense: Aspects of Intertextuality in Folklore and Literature:* traces the intentional employment of nonsense as a contrasting critique of sense:

> ... common sense is dependent upon other domains of reality for its ongoing nature. This borrowing takes place not only because of the interpenetration of art and society on an abstract level, but also because the flow of experience in our everyday lives is continually reframed, re accomplished, transgressed and reified as we use the generic forms available to us at any given point in social time... In this is the profound ring of Jacques Ehrmann's point that "the distinguishing characteristic of reality is that it is played." (Stewart, 1978, p.40)[2]

It is this playful, poignant, intentional exploration of "reframing" that my recombinant poetic works seek to point at through interactive engagement. I utilize displacement and re-framing as specific aesthetic strategies. In this case the conceptual history of each device, reframes the other — sometimes humorously, sometimes expressively. The hybrid mechanisms that the computer can engender are associative and contemplative in nature. These objects are inter-authored through the active participation of the participant. Stewart continues discussing the relevance of nonsense in literature that we can relate to nonsense relation in my device:

> The reader of Joyce, Beckett, Cortázar, Nabokov, Borges, or Swift does not explore the casual relations obtaining between events in a sequence so much as wanders between lines, along margins, exploring a discontinuous surface of language unfolding in space. Similarly, the surrealists fascination with film was a fascination with free association, with unexpected visual juxtapositions and the ability to arrange concrete images in an order at odds with that of conventional spatial and temporal reality. (Stewart, 1978, p.152)

My recombinant poetic work explores media-elements as a new form of language exploration conflating the logical and technological with the poetic. Many of the authors referenced above have informed the strategies for the construction of the **Hybrid Invention Generator** mechanism as an art work. One certainly "wanders between lines, along margins, exploring a discontinuous surface of language unfolding in space". Yet here we are talking about an expanded media-language of various fields of meaning that are being placed in relation to each other. Surrealist film, in its charged employment of juxtaposition can also be seen as informing this space.

An Intelligent System?

It is here interesting to contemplate Turning's notion of the universal machine. In Engines of Logic, Martin Davis states:

> Turing never stopped thinking about the applicability of his conception of a universal machine. He guessed that it was the notion of universality that held the secret of the enormous power of the human brain, that in some manner our brains are actually universal machines. He imagined that if a universal machine could be built, it could be made to play games like chess, that it could be induced to learn much as a child does, that ultimately it could be used to exhibit behavior one would be led to call intelligent. (Davis, p.173)

Turing once suggested that for computers to approach human intelligence, they would need to be allowed to make mistakes.

> There are several theorems which say almost exactly that... if a machine is expected to be infallible it cannot also be intelligent...but these theorems say nothing about how much intelligence may be displayed if a machine makes no pretense at infallibility. (Turing, pp 102-5; Hodges, p. 361; Davis, p. 190)

We learn from our mistakes. Of course we need to be mindfully aware of context. We don't want computers testing out the ability to randomly land planes in fog. One notes that there is a place for experimentation and a place for absolute clear-headed functionality. Yet, the logical/poetic realm engendered in The **Hybrid Invention Generator** teeters on a line which embraces both a very large logical complex system, as well as the absurdities that arise through exploration of that system. Isn't this also central to the intuitions surrounding the development of new inventions— an attitude of openness about creative solutions?

In the book *The Evolution of Technology,* George Basalla speaks about "technological dreams:"

> Technological dreams are the machines, proposals and visions generated by the technical community, whether in the Renaissance or the present time. They epitomize the technologists' propensity to go beyond what is technically feasible. Fanciful creations of this kind provide an entry into the richness of the imagination and into the sources of the novelty that is the heart of Western technology. They also challenge the conventional depiction of the technologist as a rational, pragmatic, unemotional person dominated by a utilitarian outlook. (Basalla, 1988, p.67)

It is the computer-based dream-like nature of the productions of the **Hybrid Invention Generator** that spark the imagination. The generator enables effortless substitution of (media-

element) inventions, producing combinations or media-configurations of image, sound and text elements. The concept of the "Universal Machine," as developed by Turing, is one of the central principles enabling this seemingly effortless construction - one must be mindful of the bottom-up loading of the input, functionality, and output for each encoded invention giving the system a particular flavored intelligence — Seaman's. Elsewhere I have written about what I call Re-embodied intelligence — in short giving the computer the sensibility of the artist in an emergent environment. (see Seaman, 1999)

Hodges, Turing's biographer, here describes certain aspects of the "universal machine:"

> ...underneath here lay the same powerful idea that Gödel had used, that there was no essential distinction between "numbers" and operations on numbers. From a modern mathematical point of view, they were all alike symbols. With this done, it followed that one particular machine could simulate the work done by *any* machine. He [Turing] called it the *universal* machine. It would be designed to read description numbers, decode them into tables and execute them. It could do what any other machine would have done, if it were provided with the description number of that machine on its tape. It would be a machine to do everything, which was enough to give anyone pause for thought. It was, furthermore, a machine of perfectly definite form. Alan worked out an exact table for the universal machine. (Hodges, 1983, p.104)

It is the varying symbolic properties of computer code functioning as a pun on symbolic logic— both operative as symbolic logic while simultaneously functioning as poetic media elements and exploring media-processes (built through this symbolic logic), that enables the **Hybrid Invention Generator** to function. We might call the Hybrid Invention Generator a meta-invention. I am deeply interested in bridging the artistic, philosophical, and literary with the technological through the generation of conceptual machines and the associations they engender. The participant peruses different lists that function on two levels of the system, outwardly as textual content, relevant to each device, and inwardly as conceptual substitution code variables.

Mutability and Emergence

The fact that meaning can always be seen to arise relative to context becomes a focus within electronic media-contexts characterized by mutability. This work plays with continuous processes of re-contextualization. Yet, the historical construction of inventions often proceeds by kluging together inventions from different contexts — the history of the technology behind the computer provides us with an example of how seemingly illogical mechanisms might be brought together to make a radical jump in terms of functionality— the power loom, the typewriter and

graphic display mechanisms. The **Hybrid Invention Generator** thus becomes a brainstorming tool for just such illogical combinations.

The **Hybrid Invention Generator** is a logical system that enables illogical juxtapositions to be explored. We could say that the history of the mechanisms that led to the first computer suggests the relevance for the exploration of non-closed systems exploring radical juxtaposition. This idea is central to my project. The fact that the Hybrid Invention Generator is characterized by non-closure is exemplified by the concept that one need not have a "definite stopping-place" in terms of the examination of emergent meaning — in this case emergent technological potential. This is not to say that such potentials do not have their dangers. Thus the mechanism also generates the visualizations of "monsters" and humorous devices that suggestively auto-critique this emergent process.

A playful and sometimes illogical exploration of logic provided by use of the **Hybrid Invention Generator**, enables one to interactively explore the borders of logic. Defining the edge of logic is an interesting undertaking. The following list of researchers have, through their various works, each approached this subject:

> Heisenberg's Uncertainty Principle, Von Neumann's Monte Carlo Method, Gödel's Incompleteness Theorem, The 2nd Law of Thermodynamics and statistical description of matter, Wittgenstein's verdict on the sayable and the sentence. These are all acknowledgements of the limitations of an hermetic cognitive system. (Hamilton and Bonk, 1997, p.310)

From what perspective (or perspectives) — from a set of infinite perspectives, can we address the notion of emergent meaning? If we believe that we only are able to only "point at" meaning through language use, then the generation of this meta-invention exploring media combinatorics becomes important. Thus the underlying logic that is characterized in the conjunction codes provides this interesting interplay between serious logic and absurdity in an open system. Givon, in *Mind Code and Context* provides the following observation:

> Neither language nor mind abides by the requirement of closure, except perhaps temporarily, for limited tasks. Both language and mind are necessarily open systems that continually expand, add meta-levels, learn and modify themselves... consciousness is forever adjusting its frame, shifting meta-levels, it keeps re-framing and reflexively framing itself... It is the precondition for the mind's ability to select, evaluate, file, contextualize and respond appropriately to mountains of information. (Givón, 1989, p.4)

The best way to conceptually engage with complex potential configurations of media-elements is not through the use of a text but through the experiential examination of mutable media contexts. This was the central concept at operation in my past work, *The World Generator*. In terms of the "operational" nature of context, characteristic of the **Hybrid Invention Generator**, we become engaged with the observation of a situation that "is forever adjusting its frame," with the potential for "re-framing and reflexively framing itself..." based upon one's participation. Givón talks about "abductive inference" and "analogic reasoning." He elucidates these as follows:

> The non-pragmatic tradition speaks of two modes of knowledge — or modes of inference — deductive and inductive. The first proceeds from the general rule to its specific instances. The second presumably proceeds from specific instances to the general rule. Pragmatically-based abductive inference — concerning appropriateness of context, importance, relevance, similarity or explanation — is in principle a different kind of reasoning. It proceeds by hypothesis, guesswork or intuition, often by analogy. It is thus, in principle, unconstrained. (Givón, 1989, p.7)

This device can be read as a machinic generator of "specific instances" of language-vehicle exploration, stemming from an elaborate initial intuition or hypothesis. Thus, abductive logic is pivotal to the workings this project. It is paradoxically constrained by the logic and qualities of the media elements loaded into the system while simultaneously "unconstrainded" in terms of the suggestive nature of the inventions that the system derives through radical juxtaposition. To this end, the associative environment of these "kluged" inventions and the textual material that accompanies them, transcend the mere joining together of two inventions. This principle is central to the process of invention itself, where ideally the outcome is greater than the sum of its parts. In the normal construction of inventions, intuition is often first made conceptually operational through models and visualizations, and subsequently physically built and perfected. I hope at a later date to actually build some of these derived inventions for exhibition.

Operational Metaphors in the **Hybrid Invention Generator**

In a future paper I will elaborate on the notion of operative metaphor in the device. What if we are to frame education as a human invention? Could the operative metaphors of the **Hybrid Invention Generator** lend a mode of generative understanding as pertaining to new approaches to educational models? Certainly these metaphors point to notions of transdisciplinarity — the hybridization of multiple disciplines. I have currently been named head of the Digital Media Program at Rhode Island School of Design. Here I plan to explore such "hybrid" metaphors.

We might also approach language construction through similar metaphors. Again, this will be developed in another paper.

In closing, the **Hybrid Invention Generator** provides an environment for rich associative and contemplative activity surrounding the notion of invention. I am indebted to Intel for providing the funding for this project and the people who became involved in the research leading up to the working mechanism. In particular I would like to thank Gideon May for his work on the project.

BASALLA, G. 1988. *The Evolution of Technology*. Cambridge: Cambridge University Press.
ECO, U. 1989. *The Open Work*. Translation: A. CANCOGNI. Cambridge: Harvard University Press.
GIVÓN, T. 1989. *Mind, Code and Context: Essays in Pragmatics*. London: Lawrence Erlbaum Associates.
HAMILTON, R. and BONK, E. 1997. The Typosophic Texture. *Politics/Poetics: Das Burch Zur Documenta X*. Ostfildern-Ruit: Cantz Verlag.
HODGES, A. 1983. *Alan Turing: The Enigma*. New York: Simon and Shuster.
TURING, A. 1992 *Collected Works: Mechanical Intelligence*, Amsterdam:North-holland

SEAMAN, B 1999 *Recombinant Poetics: Emergent Meaning as Examined and Explored Within a Specific Generative Virtual Environment*, Ph.D. Thesis, University of Wales. Available online from the Langlois Foundation
STEWART, S. 1978. *Nonsense*. Baltimore: The Johns Hopkins University Press.
WALDBERG, P. 1965. *Surrealism*. London: Thames and Hudson.