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Designing Transmutational Worlds in Game Space.

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Game design has been recognized as a major field within the multimedia industry in recent years. This paper documents a model for the design of game worlds that explores their nature as mutable, fluid structures and how this property of the space may be used to create new types of communication and expression. Modes of representation in digital games are explored in terms of game aesthetics, structure and logic. A model for 'world-making' is developed that identifies key components of digital media language and their relationship to shifting modes of representation.

Artists making digital games may take on the role of world builder – creating coherent alternative worlds from patterns of information. The representations of these worlds are made of meshes, geometric primitives, textures, materials, sound, music, text, graphics, animation and other media elements. However, they are also defined in terms of the relationships between these elements – their behaviour, spatial location, connection to parameters in the world, and associated meaning.

Factoring gameplay into the practice of 'world-making' extends this practice by involving the player/user into the experience. Virtual worlds that set up situations and allow the player to act out scenarios are naturally quite different than static, virtual worlds that enable the navigation of a single point of view through space. Electronic spaces can manifest complex relationships between their representation and the underlying system that defines them. Playing with the relationship between the representation and the system develops its capacity as a dynamic, expressive generator of new meanings. This opens up opportunities for the exploration of virtual world not as simulation of the real, but as a medium for the development of other coherent, alternative worlds whose representation is fluid and mutable.

A model of world design is developed that identifies the following key principles:

- 1** Space: Structure, navigation.
- 2** Language/culture: the 'local' flavour.
- 3** Experience design: the representation.
- 4** Logic: rules of the world.
- 5** Behaviour: how do its inhabitants react?

This model is explored in relation to a series of worlds that are structurally different, but all connect fluid representations of electronic spaces with gameplay, interactivity, and system design. Artefact: Semiomorph is a digital game that explores "semiotic morphism", a "systematic translation between sign systems" in which signified messages can be mapped onto various signifiers, multiplying and mutating instances of semiosis. Iconica is an artificial world made of language, where iconic elements are the basic building blocks of a world literally made of language. Six elements from this language relate to unique pictorial styles and soundscapes used to represent the world, ranging from plastic knowbots and surreal iconography to electronic abstraction and the dirt of the real world. Finally, Idea-ON>! is a database of ideas and experiences contained within a collection of virtual worlds that explore the nature of electronic space.

Designing transmutational worlds in game space.

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Introduction

Digital games are often situated within interactive 3D spaces that create the feeling of being in 'another world'. The limitations of realtime simulation make it necessary for compromises to be made in the representation of game worlds – it is not possible to recreate every detail of 'reality' within these worlds. So, they are abstractions of reality that rely on the player's mind to fill in the gaps.

This paper looks at principles of world design for digital games in terms of the most significant elements needed to 'create a world' in the player's mind. The player becomes the subject addressed by the game world and enters a dialogue with it that both defines and creates it. Interpretation of the world occurs both at a macro level, through immersive experience of 'being in the world', and micro level, through the accumulated detail of events, actions and communications with the world. Principles of world design are articulated through a series of projects that attempt to create coherent, alternative worlds that express the artificial nature of digital game spaces.

Many different styles, genres and forms have evolved during the brief history of digital games. This investigation is interested in a subset of these forms, particularly games with the following features:

1. realtime simulation - ongoing generation of game world
2. multimedia space - typically 3D spatial representation
3. interaction and agency within the game world
4. entities within the world react to the player

This is a rather inclusive definition, but also may include games that do not have a rigid scoring system or set goals, and that instead encourage exploration and experience of a world.

World design extends beyond the construction of a space. Without agency, the player reverts to the role of viewer – a ghost who can simply observe the world at a distance. So, the expressive and communicative capability of a game world comes through the logic and behaviour of its inhabitants and the flavour of its 'culture'. The media elements used to construct electronic spaces are simply a representation of this underlying system of logic and communication. Screenshots or movie clips may demonstrate the 'look and feel' of a game, but in order to understand it fully it must be played. This system of interaction and play – the 'dialogue with the game world' – is central to the formation of meaning.

Without this interaction and engagement with an underlying system that defines the logic and parameters of the world there is only a simulated space.

Likewise, this system does not have the same immediacy and presence if it is not represented as a realtime simulation. As this system is centered around the player, some key questions need to be asked about the game world. What do you do when you are there? How do you do it? Who else is there?

As game worlds are stylisations or abstractions, a methodology for determining what is important in creating a believable world versus what is simply decoration or unnecessary detail needs to be established. The old axiom of 'less is more' applies here as much as anywhere else, but less of what? We need to be able to find the key signifiers of 'world' and a model for engaging a player with them. The model of world design presented here identifies the following key principles:

1. Space: structure and navigation
2. Language / culture: the 'local' flavour
3. Experience design: the representation
4. Logic: rules of the world
5. Behaviour: how do its inhabitants react?

This model has evolved through a series of projects developed as part of my own practice of 'world-making' as creative expression. The iconography of *Iconica* will be used to explore ideas on language and culture. Space and experience design are explored in the shifting representations of *Semiomorph. lifeSigns* will be viewed as a 'generative meaning system' that generates and evolves audiovisual language systems.

It is possible to play with the language of game worlds by exploring alternative strategies for representing their underlying symbolic system. This could be described as a 'zone of free play' between the logic of a game world and its manifestation as simulation that opens up an area of experimentation and play with meaning and representation. The focus of these projects is on abstract worlds that engage the player in the process of meaning production.



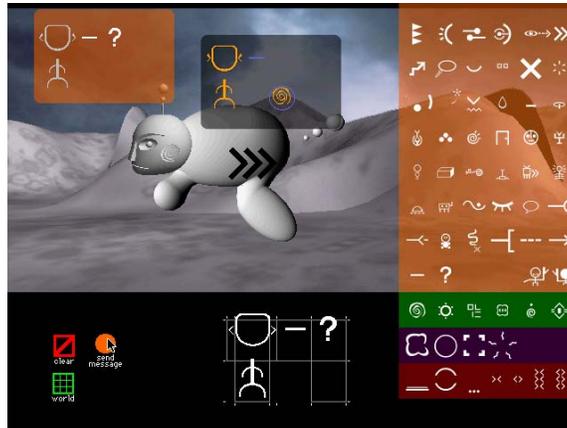


Figure 1. Screenshot of *Iconica* and its language.

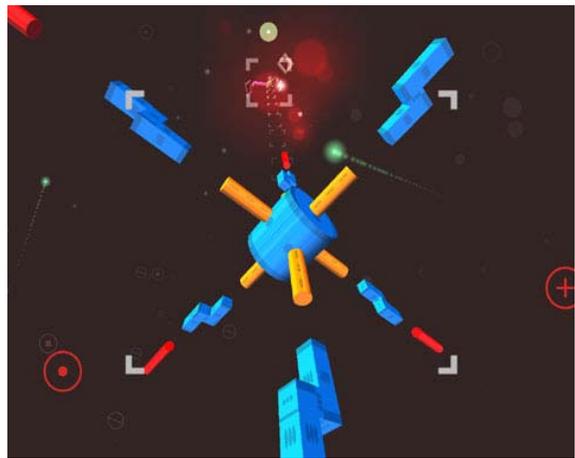
Iconica [3] is an interactive world that evolves and changes according to the rules of an artificial life system. Players decode this world by using its 'native language' that is made of icons that describe aspects of the *Iconica* world. These icons may be combined using a simple grammar to create more complex meanings. This grammar is also indicative of the logic of the world. Experiencing *Iconica* involves learning a new language in order to understand its entire meaning.



ARTEFACT>>> modes of re- presentation	word	diagram	icon	simulation
	logo	 M3TA>	 INFOS CORP	 SUPER PLASTIC PIXEL
building block				
character				
avatar				

Figure 2. Screenshot of *Semiomorph* and table of representations.

Semiomorph [4] is a third-person 3D action game. The player must navigate a space, collect objects, and avoid or attack enemies. However, this process of playing the game is connected to changes in the representation of the game environment itself. This approach is inspired by the idea of ‘semiotic morphism’, an experimental concept from computer science that attempts to generate the translation of meaning from one medium to another using computation. This abstract idea is given tangible form in the *Semiomorph* world through its space, experience and logic.



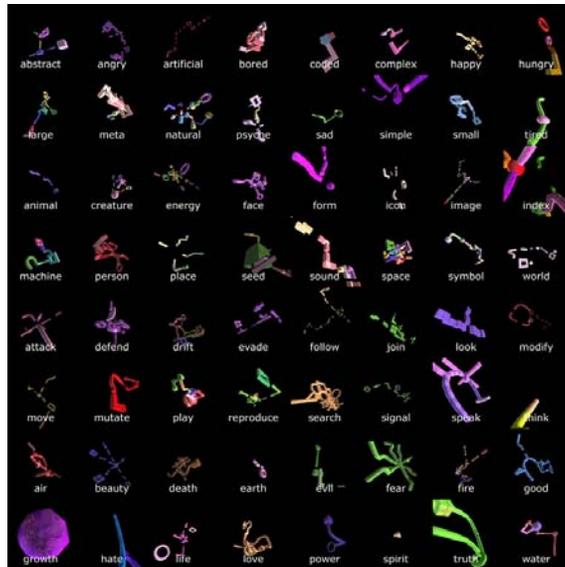


Figure 3. Screenshot of *lifeSigns* and generated language.

lifeSigns [5] is a game world that generates audiovisual languages. It uses a generative system based on common characteristics of known signs and symbols [6] to create new configurations. These are extended further through interpretation into animation and sound, resulting in ‘living signs’ (the lifeSigns) that may be performed by the player. Multiple players navigate the abstract space of the world and play the lifeSigns like synaesthetic, audiovisual instruments. This process contributes to each lifeSigns success in the world, and also influences their meaning, thereby generating a language.

Aspects of these projects will be used to illustrate the discussion of the principles of world design articulated earlier.

1. Nature of electronic space

Spatial relationships are important in defining a world both in terms of structure and navigation. In his useful taxonomy of electronic spaces, Anders notes that an “anthropic cyberspace recognizes the subtle interplay between our perception of space and our language.” [1]

The player's point of view and method of navigation shapes their perception of the space. Established conventions include situating their viewpoint above the world (god's-eye view), behind a representation of the player (third-person view), or a direct viewpoint from the ‘eyes’ of the player (first-person view). The pace of action may vary in this navigation, ranging from slow processes of exploration and discovery to the fast action of driving and shooting games. Increasingly, the simulated physics of the game world comes into play so that forces such as friction and gravity affect the player's navigation. Of course, these rules of the real world can be modified or they may not apply at all. Worlds may be defined in terms of different kinds of space with alternative laws of physics or structural conventions.

Semiomorph creates a world that exists within its own rules of space by presenting a transmutational space in the familiar 3D perspective of third-person action games. Gravity still functions and the player must walk to get from place to place. In some levels of the game, these rules are broken down further – in one level the player may walk through walls represented as surfaces made of graphics and text.

The space of *lifeSigns* is very abstract, consisting of multiple layers of signs and symbols generated by the game world. However, the navigation draws upon conventions from flight simulators in which the player typically orients their point of view in virtually any direction and then ‘throttles’ forward. So, despite the highly abstract nature of the space, ‘realistic’ movement is used to make this world accessible and provide a point of familiarity.

2. Language > Culture

A world is not just a navigable space. Worlds are populated by and interpreted by their inhabitants who provide names for places and objects. Negotiations of meaning may occur between occupants of the space. This network of language that is particular to each world may be extended to describe the unique culture of that world. In game worlds this culture may be simple, but it is still there and makes the difference between what is simply a space and a coherent, meaningful world. In games dealing with fantasy and science fiction themes these cultures may be created as intricately detailed and vastly complex, often extended further by fans of the game world. Even in simple games, the “game play takes place within a *representational* universe, filled with depictions of objects, interactions, and ideas out of which a player makes meaning.” [9]

Language is the central focus of the *Iconica* world. Its inhabitants ‘speak’ a language of their own, which consists of icons that describe elements, forms, entities and spaces in the game world. New combinations of these are constantly being created by the entities in the world through their communication with one another. An artificial life model, a set of rules and algorithms that emulate life processes in a computer, drives the evolution of all aspects of the world. The result is a kind of ‘digital world’ culture shock that demands from the player a considerable investment of time and energy to learn the native language of *Iconica*. Prior to this knowledge, the player has the sense of stepping into another culture that has its own conventions and logic. The ‘culture’ of *Iconica* is largely driven by the relationships and codes embodied in its language that in turn are an expression of the underlying artificial life model. In this way, the world is literally ‘made of language’ in that it is experienced and perceived through this culture/language and the computer program that gives it material form is also defined in terms of this same culture/language.

In *lifeSigns*, a simple model for the emergence of audiovisual languages that reflect the aesthetic preferences of the audience is created in the game world. If most people like symmetrical forms, then they will dominate the visual landscape of the world. Likewise, if most people dislike rectilinear forms then they will ‘die out’ in the world system. Forms that emerge from the system

may be named through the selection of sixty-four possible 'meanings'. This process is cumulative, so that if twenty players choose *truth* and ten choose *beauty* then the lifeSign will 'mean' *truth* twice as much as it does *beauty*. It facilitates the emergence of a culture/language through the play of the game.

3. Being (out) there

Creating a world also means creating a tangible, engaging experience of that world in terms of images, sound, animation and music. The immediacy of being there in the game world is primarily a result of being immersed in this rich media experience. This is combined with the visceral experience of embodying the player within their avatar as it reacts and interacts with the game world. The representation of the game world acts as both interface and experience in the dialogue between the player and the system. In these worlds "narrative and time itself are equated with movement through 3-D space, progression through rooms, levels, or words" [7] and this journey is represented through sound and image.

Virtual worlds have the innate ability to shift and change, mutate and transmutate, and layer multiple modes of representation. *Semiomorph* tries to create a tangible, immediate experience of this kind of space by using gameplay that is directly linked to shifts in the representation of the game world. The resulting space is one that is constantly shifting and changing, blending several forms of representation into one experience. Although the underlying structure of the space does not change, the different instances of the game objects may be simultaneously represented using four different systems.

Representation of space, game objects and characters within *Semiomorph* use one of four systems: (1) *Word*: text labels appear on spaces and game objects; (2) *Diagram*: spaces and game objects are represented in wireframe mode; (3) *Icon*: simple stylized representation of space and game objects; and (4) *Simulation*: spaces and objects are texture mapped and made more complex to increase realism. These systems of representation are expressed in terms of images, sound, music and graphics to generate a rich experience of transmutational space.

The *lifeSigns* world is an interactive installation that combines two separate views of the space. A large projection shows a map of this world, accompanied by a generative soundscape. Four workstations placed around the edges of the map enable navigation and play of the world. The space appears to be infinite as the player may continuously navigate and search in any direction – there is no up or down. Although it is a three-dimensional representation there is no horizon line or indication of linear perspective, but instead multiple layers of abstract form, colour and movement.

lifeSigns appear throughout the world. They have been generated by a system of rules that govern features typical of signs, symbols and icons such as symmetry, form and colour. The results of these rules are encoded into a 'dna string' that uniquely defines each lifeSign. This also drives their behaviour as they choose to attack, befriend, leech, or mutate one another.

They may also send messages or commands. Using a bank of four touch-sensitive buttons, each lifeSign may be performed by the player resulting in the generation of synaesthetic sound and animation. Player input increases the energy of the lifeSign and therefore it's chance of survival as low energy lifeSign will eventually die in the world. Furthermore, those with excess energy may reproduce and generate offspring that combine features of their parent icons.

Although the world that is generated in *lifeSigns* consists of abstract entities and forces it is represented and experienced with the immediacy of realtime simulation.

4. Symbolic made real

Worlds of code are made perceptible as 'real experience' when expressed as a simulation. A virtual world may be understood as an actualisation of a symbolic world and digital games to "constitute a kaleidoscopic, *pretissimo* exercise in semiotics, which is the ever-changing interaction of signs." [8] Extending beyond the realm of metaphor and fiction an abstract, coded world is presented as a sophisticated simulation that situates the player as a part of that simulation. The game world is quite literally addressing the player as having agency in the system. At the same time, the players mode of perception means that psychologically, the player is in that space - it becomes their reality.

In this way, I would argue that electronic space can be described as the 'symbolic made real'. The symbolic has real affect, and is represented as a real space through simulation. Of course, this relies on the assertion that 'we want to believe' that mediated experiences have been assimilated as natural and 'real' in the first place.

So, electronic space blurs the symbolic and the real by representing a highly abstract space (the logic and relations of the computer) in a realistic simulation (the immersive / interactive experience). This facilitates the 'real experience' of highly abstract symbolic spaces. Given that the virtual world can simulate what we know about the real world, as well as any number of possible alternative worlds then metaphorical, symbolic worlds can be experienced in a similar way to that in which more realistic simulations are experienced.

Semimorph demonstrates this idea of transmutational space represented with the immediacy of 'reality' in its blending of different sign systems into a coherent interactive experience. The underlying logic of morphing between different codes of representation, a highly abstract concept, is rendered into a tangible, perceptible experience through its expression in the game world.

This idea is taken to another level when artificial life or generative systems are introduced. In this case the entities in a virtual world may adapt their behaviour in order to generate new meanings. The process of meaning generation is refracted and reaches a larger number of possibilities as the limits of the system are relaxed. Many digital games restrict the behaviour and

potential of the game world to predetermined outcomes. Giving entities the ability to evolve and adapt their semiotic codes allows the generation of new meanings not restricted to what is already understood to be significant. It includes the machine in the creative process. This is similar to the paradigm of genetic programming, which involves the use of genetic algorithms to evolve better computer programs (written by other computer programs), but applied to known semiotic systems.

This is what may be described as a 'generative meaning system'. *lifeSigns* demonstrates this concept by evolving audiovisual languages by connecting its evolutionary process with feedback from the players of the game. This occurs within a simulated world made of signs that have agency to change their own meaning, relationships and environment.

5. Media Creatures: the role of agency.

Humans have developed sophisticated media for the communication and exchange of information. More recently, that media has evolved its own agency – it can talk back. Bots, AIs, synthespians – the artificial intelligence (AI) systems that reside in the digital realms of the computer are representative of this new active digital media. This occurs through “the erasure of embodiment (that) is performed so that ‘intelligence’ becomes a property of the formal manipulation of symbols rather than enaction in the human lifeworld.” [2] These agents, ‘media creatures’ or entities may personify aspects of the game system and characterise the game world through their actions and communications.

The entities in *Iconica* are able to manipulate and change their world. As the world is constructed from symbols a set of transformations of those symbols is defined in each entity to represent behaviour that is typical of life – they may attack one another, reproduce, and exchange information. They are able to autonomously take action to realise its goals.

They have ‘needs’ and ‘desires’ in terms of the simulated system. An entity that does not find energy will die, an entity that is ready to reproduce that does not find a mate will not have offspring. This gives them a role and place in the world that is consistent with its rules and possibilities that is revealed in communication with the entity when it will tell of its needs, desires, and history in terms of the simple codes of the *Iconica* world.

A similar set of behaviours is demonstrated by the entities in *Semiomorph*. These media creatures personify the four modes of representation embodied in the work – text, diagram, iconographics and simulation. However, they have a more direct relationship to the player as they have a significant role in the gameplay. Depending on the actions of the player they may choose to pursue and attack the player, dance around them, or ignore them. Changes in the game may alter these relationships so that a friend suddenly becomes an enemy and so on. The creatures in *Semiomorph* also interact with one another in similar ways.

In order to make this behaviour work, the entities navigate their world in an intelligent way and have strengths and weaknesses so that their interactions are not predictable. Their behaviour makes them believable as inhabitants of their space, and communicates the idea of this space as a world that can support life.

Concluding remarks

Through a combination of believable space, culture and language, engaging experience, meaningful system design, agency and artificial intelligence convincing artificial worlds may be constructed in digital games. These principles may contribute to the formative discipline of world design as it relates to virtual worlds and digital games. The role of the 'world designer' combines aspects of storyteller, designer, overseer and builder in these activities.

The model outlined forms the basic structure upon which further development and investigation is needed, particularly in relation to the development of virtual cultures and the significance of the 'symbolic made real'. At this stage, it provides an approach to world design that articulates the complex and varied ways that meaning is produced in artificial worlds. Furthermore, the works discussed demonstrate the potential of digital game worlds to be transmutational spaces that explore and play with the generation of meaning. Building understandings of the new role that world design has to play in the complex artificial spaces of digital games is important to developing coherent, meaningful experiences for players.

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