

# Constructed Narratives a Tangible Social Interface

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## ABSTRACT

*Constructed Narratives* is a *tangible social interface* designed for use in public spaces where people have the opportunity to encounter the game and subsequently learn about each other. The hardware and software system architecture developed for this project could be applied for experimental computer-based interfaces for several human computer interaction domains including collaborative learning (CSCL), and collaborative design activities in the tradition of computer supported collaborative work (CSCW). The current domain explored for *Constructed Narratives* is that of computer systems designed to enable shared experience through play, or computer supported collaborative play (CSCP).

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## ACM Classification Keywords

H5.m. Information interfaces and presentation: HCI, Design, Arts and Humanities, Fine Arts

## INTRODUCTION

Hoffman's 1894 manual to Froebel's Kindergarten Gifts pedagogy for early primary school education states that, "All children show an irrepressible longing for what we call play. Their whole life and soul, all their energies, all their thoughts seem absorbed by it. ... It is through play that nature develops in the child all the faculties both of body and mind, in a safe and healthful manner. It is by playing that the child, when properly guided, acquires habits of industry, perseverance, order, regularity, and punctuality; that the nature of things reveals itself to him in a clear manner, easily intelligible to his capacity." [8] The child learns to solve design problems with the kindergarten gifts. And through this act of problem solving he discovers the properties and possibilities of designing her world. [14]

The *Constructed Narratives* project is a block-based construction game designed for use in public spaces that afford the opportunity for individuals and groups of people, who are not acquainted with each other, to encounter the

game and subsequently each other. It is designed primarily for a mature audience of older teenagers and adults. The goal is to provide a platform that supports discourse in environments where "keeping comfortable distance" between oneself and others is the norm and there are few opportunities to break the walls of curiosity and silence to engage in discourse, discovery, collaboration and learning.

The *Constructed Narratives* project was initiated from first-person observations and inquiries about the quality of engagement between strangers, both positive and negative, in public spaces. Questions about how one comes to feel comfortable or entitled to dominate a public space led to the development of a framework for computer-based tools that would be used to provide a bridge or common-ground for discourse between people in a public space.

Pragmatism, constructivism and practices in critical interaction design, provide a theoretical base for the framework for developing *tangible social interfaces*. [11, 13, 5] These theories and practices all seek to understand and leverage the construction of meaning people generate to understand the people, places and things in our daily encounters. A common thread connecting the theoretical positions of Rorty's "liberal ironist," the constructivism theory that all humans, either as individuals or as collectives are portrayed as constructive agents, and their meanings and knowledge are portrayed as constructed products, and



Figure 1. *Constructed Narratives* at the Kiasma Museum for Contemporary Art in Helsinki, Finland.

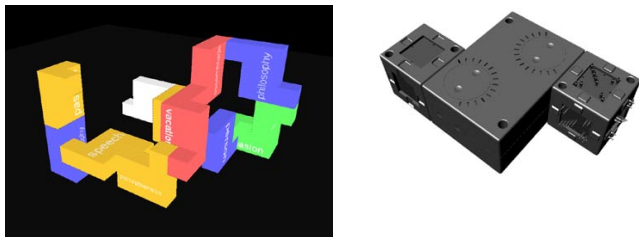
Habermas' theory of the communicative act, is the role that intersubjectivity plays on the quality of discourse, learning and social interaction between people. Intersubjectivity refers to the dynamic interrelationship of self and other that leads to human consciousness and self-identity and focuses on methods individuals use to arrive at similar or complementary explanations of their shared experiences in the world. [15]

*Constructed Narratives* is a mediator, or discourse wrangler, that encourages *meaningful* dialogical exchange between people in public spaces. The observation, which will vary culturally, is that except under *unique circumstances*, most people do not engage in *meaningful* discourse with others they encounter that they do not know, or know well. *Meaningful* discourse is defined as conversation between individuals that extends beyond basic introductions of name and/or personal logistics. An example of a *unique circumstance* is when an unusual event occurs that creates a shared experience (i.e. street performer, automobile accident, shared physical experience such as dancing or playing sports, or an unexpected person, animal, thing or event enters the shared space.) All of these events have the potential to create a common-bond experience – a moment of shared experience or knowledge that places a metaphorical bridge between two people or two “worlds.”

The act of construction is used as a metaphor to illustrate how a simple artifact, a building block, can be used to encourage and support discourse between collaborating builders.

### LITERATURE SEARCH

The *Constructed Narratives* project is part of a lineage of projects based on the early work of Architect Jonathon Frazer's *Universal Constructor* generative system. [3] Frazer's pivotal work has been deconstructed and re-designed by many researchers and students in international research labs and universities. All of the projects influenced from Frazer's work have focused on developing three-dimensional screen-based interfaces that replicate and/or augment the physical construction made by tangible user interfaces. The screen interfaces can be divided into three categories:



**Figure 9. The Virtual Build with *Semantic Engine* pattern and word search applications and a CAD model of the *Constructed Narratives* block.**

- Sensorial effects
- Information navigation
- Computational interpretation of the physical design

Sensorial effects interfaces generally present a mirror of the physical construction with light, sound, or color mapped onto the screen-based nodes construction. BlockJam, from the Sony CSL Interaction Lab, is a set of twenty-five blocks that can be arranged on a flat surface to compose musical phrases. [9] The early version of ActiveCube, from Osaka University, was a set of cube shaped blocks that when attached created direct replication of the construction on screen. [12] Peano Cubes from MIT Media Lab are a set of blocks whose physical construction is replicated on screen. The screen interface provides tools that can be used to change the color patterns of multi-colored LED lights embedded inside the block. [7] Instant City, designed by Rosen & Spaderman Enterprise in Basil, Switzerland, is an eloquently designed collaborative sound generating table game. The blocks are simple rectangles of semi-clear plexiglas. The sounds are triggered based upon the amount of light, which passes through the plexiglas to light sensors on the table. [ 6]

Information navigation interfaces such as Navigation Blocks from the University of Washington does not use the tangible block as a building device. Rather the tethered block is used to navigate pre-selected information on the web. [2 ] Media Blocks uses the physical blocks as phicons. Tagged blocks are used to link to information in the computer system. [16] On the other hand the MIT Media Lab Triangles project is a set of identical flat plastic triangles. When attached together the user can organize media elements to form a narrative. [4] The Strata ICC project uses transparent physical tile layers as a means to replicate various systems, such as energy consumption, in an architectural structure. [17]

Systems that interpret the shape of a physical construction employ algorithms that search for known shape patterns in the physical construction. When a match is found, a three-dimensional texture map is applied to the screen replication of the construction. For example, the screen interface for a later version of ActiveCubes can recognize a few basic symbols such as the shape of a toy airplane. When the physical blocks are correctly assembled, the screen interface presents an illustration of an airplane. [12] Recognizing a pre-selected group of symbolic shapes, as the MERL project attempts, can be an intractable problem. The MERL project uses a huge amount of computing power to analyze a complex shape like a block castle taking fifty-three minutes to crunch data for a maximum set of 560 blocks. [1]

### SYSTEM ARCHITECTURE OVERVIEW

The system architecture, for the *Constructed Narratives* project, explores methods for designing an open-topology tangible component network of objects that integrates theories of visual semiotics and rhetoric as algorithmic drivers for the builder's game play experience. There are four layers in the system architecture including, the interfaces,

host data application, *semantic engine*, and display system. The system is designed to support an open-topology (ad-hoc) network of physical blocks. The open-topology network is formed when a physical block is connected to another physical block. Prior to working with the blocks, the builder completes a brief on-line profile questionnaire that is used to seed the system with basic profile information about the builder. The host data application logs each block along with the identification of the builder responsible for attaching the block to the emerging construction. The *semantic engine* aggregates information about the emerging design patterns in the construction, the connection points of the attached block, ownership of each block in the network, and the builder's profile. The *semantic engine* processes this data using a set of design rules, which are used to perform a word search through a computer-based English lexicon. The results from the search are printed on the surface of the blocks in the virtual rendition of the physical construction. The display system is a navigable virtual 3D rendition of the physical construction that is updated in real-time and projected into the play arena space.

## CONCLUSION

The *Constructed Narratives* framework is a platform for developing interactive systems that are transformative mirror for its users. Rokeby's theory of transforming mirrors states that a technology is interactive if it provides a means by which the participants can communicate with themselves such as a mirror. The transformative mirror is not a perfect reflection or mimicry of the user. Rather, the mirror must have imperfections embedded into its surface to refract, bend, invert, and add dimensionality to what it reflects. Thus allowing the interface to transcend basic mimicry and become a vehicle for transformative interactivity. [10]

The modular design of the *Constructed Narrative* block allows for articulated three-dimensional designs that challenge the typical stacking techniques afforded by most rectilinear block shapes. The *semantic engine* software application includes a unique search algorithm based on shape grammars, visual semiotics, and rhetoric. These system attributes provide the means by which to design *tangible social interfaces* that give the player an experience that is the sum of the quality of personal and collaborative interactions.

Additional information about the interdisciplinary design of this project can be found in the "*Design Processes to Support Interdisciplinary Research and Development of Tangible Social Interfaces*," paper in this proceeding.

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