Mark Your Territory: Bridging Ownership between Real and Digital Spaces

Andrew Quitmeyer
Digital Media Program
Georgia Institute of Technology
Atlanta, GA, USA
andrew.quitmeyer@gatech.edu

Michael Nitsche
Digital Media Program
Georgia Institute of Technology
Atlanta, GA, USA
michael.nitsche@lmc.gatech.edu

ABSTRACT

This paper describes the design of a hybrid physical/digital system for claiming ownership of territory. By combining digital and natural affordances for staking ownership, I provide a new remediation featuring greater embodiment than is available in existing services such as *foursquare*.

The core functionality draws from the combination of physical sensing and digital communication via an Arduino ADK attached to an Android Smartphone through custom software. The design on both digital and physical ends of the system promotes feedback between these realms. Actions in physical realms affect those of the digital, and digital claims to ownership can likewise manifest themselves in the real world. The "Mark Your Territory" system serves as a rhetorical prototype to encourage deeper analysis for improving the quality and flow of information between physical and digital realms.

Author Keywords

Territory, Ownership, Arduino, Android, ADK, Sensing, Biological incorporation, Cybiotic, Hybrid Space

General Terms

Performance, Design, Theory, Experimentation

INTRODUCTION

My research focuses on creating hybrid, digital/physical, tools for the analysis and dissemination of organic and environmental information. I incorporate biological organisms and processes into computational media to not only learn from their behavior, but to also explore interaction methods in channels accessible to more than just humans. An example of my work in this area includes creating RFID and vision systems to track primates, insects, and fish which teach novel movements to robots.

Mark Your Territory grew out of parallels between my studies of animal behavior and observed shortcomings of social (human) media today. Specifically, it addresses the deficiencies in *foursquare*'s digital remediation of the inherently physical act of marking one's territory. While *foursquare*'s design uses the new, digital affordances of instantaneous sharing, it overlooks many valuable, existing conventions such as a gradient of ownership, or the ability

to leave unbiased profiles. *foursquare*'s interaction is largely disembodied.

Mark Your Territory is a practical design study about the idea of ownership spanning both the physical and digital world. In discussing his reasons for incorporating actual biological processes into his "biotic video games", biophysicist Ingmar Riedel-Kruse states that, "the currently available computational power poses challenges to realistically emulate even modest biological phenomena" [1]. We still fail to emulate many physical performances and places in the digital world. On the other hand, merely shunning the idea of digital spaces needlessly deprives us of their new, unique, and valuable tools, such as social media connectivity, or large-scale real-time tracking. Thus, to effectively bridge this rift between the physical and digital worlds an equally an equally hybrid approach for designing a territory creation system is needed.

TERRITORY/OWNERSHIP

Eons of evolution have spawned complex, powerful systems which enable organisms to disseminate information grounded in a physical location. A dog urinating on a tree, for instance, leaves not only the information that a specific animal had been to a place, but also data concerning the creatures physiology, stature, frequency of visits, and mood. Semiochemicals are "any substance used in communication, whether between species (as in symbioses) or between members of the same species" [2] and are inherently tied to specific points in an environment.
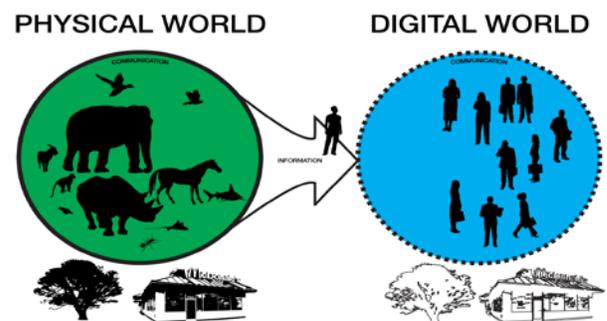

Figure 1: The standard model of many digital applications.

Physically-transmitted chemical communication pervades the natural world (particularly in organisms' attempts to claim property), and, as a medium, provides its own, unique affordances [3]. First the situated chemicals can possess a high spatial-resolution far surpassing the abilities of GPS. The universal accessibility of physical matter also allows for communication over the boundaries between species. Organisms have evolved abilities to detect and decipher the olfactory or oral stimuli triggered by the chemicals of a territory's other inhabitants. Ephemerality of physical leavings grants the semiochemical system hysteresis, displaying knowledge of how well the ownership of a territory has been maintained. Gradients of ownership are also possible through the directly or indirectly controlled release of chemicals into a habitat. Finally, one of the most interesting aspects of semiochemical communication is the ability to leave unbiased profiles. The chemistry of an animal's marks can unwittingly reveal to others important facts detailing the animals physiology such as diet, mood or mating cycle. This characteristic tends to be quite non-existent in the digital-social world as the bulk of one's personal information must be curated by the person him or herself.

As humans developed language, we began to leave the rich, chemical communication system in favor of this new, intra-species means of sending high-bandwidth, precision messages. The accuracy and power of humanity's languages, culminating with the creation of the digital world, gave us a leg-up in survival, permitting us to plan, collaborate, share, and access past knowledge in unprecedented ways.

This shift, however, has also lead to a sacrifice of universality and robustness in our interactions with the world. This is particularly evident in many of today's systems which attempt to duplicate the physical marking of territory in an entirely digital, human-exclusive fashion.

Foursquare
foursquare, currently the most popular platform for tying digital information to physical venues [4], nominally serves to "help you explore the world around you"[5]. The service primarily functions, however, as a way for users to compete against one another over real world venues in order to collect virtual rewards.

On the technical level, this competition merely consists of players transmitting low-accuracy GPS data along with the *foursquare* ID of a nearby venue to a centralized database. Each submission constitutes a "check-in," and while you can perform an unlimited number of check-ins, only one check-in per day per venue will count towards any rewards. Accumulations of various check-ins unlock different virtual badges applied to one's digital profile. The person with the most check-ins at a particular venue within the past 60 days earns the title "Mayor" of the location. Additional anti-cheating controls have recently been implemented, but

these are easily subverted by manipulating the API, or simply checking in via the mobile site. On top of all these controls exists an arbitrary limiting function described on their support page: "It's ok to check in at home, at work, at the coffee, shop, at a park, at the train station, at a restaurant, picking up your dry cleaning, but if we see you checking in at every venue you walk by, you won't get credit for those check-ins" [6].

foursquare's success comes from pairing a novel use of a single element of real-world information (GPS data) with the affordances of traditional digital media. Merely adding-in low-resolution locational data, however, disembodies the user and encourages breakdowns of the rule-space. Moreover, battling discrepancies within the system through arbitrary, hidden rule-sets breaks down the gameplay, destroying immersion. Alternative design strategies built upon proven ownership systems from nature could circumvent these shortcomings.

MARK YOUR TERRITORY
Mark Your Territory has been fully implemented and works in five main steps: 1) connect the customized Arduino board to an Android phone's USB; 2) this automatically starts the *Mark Your Territory* app; 3) connect the sensor to markers customized for each user; 4) urinate on the marker, changing the physical/ chemical condition of the marker as well as affecting the digital sensing; 5) leave a high resolution physical trace (the marker) at the location and be automatically checked in at the digital locale on *foursquare*.

Design
Individuals carry around a set of enhanced business cards. The sharpish appendage on the bottom lets you literally stake claims in natural environments while the adhesive backing enables its use in urban settings. During activation of the physical/digital check-in, one urinates onto the center of the card while connected to the phone/microcontroller's probe. As in nature, the quality of your act influences several characteristics of your claim to territory.

Figure 2: a) System overview b) screen shot mid- "check-in"

Sensors detect the amount of urination and reward the user with high ratings, good comments, and potential bonuses, but miniscule leavings can punish by shifting GPS coordinates and disabling virtual rewards for the act. Each marker features a QR code hidden by soluble, silver gouache that is completely or partially washed off in the

act. Depending one's volume, focus, and aim (dedication to a venue) passers-by will have varying difficulty levels scanning the underlying QR code containing user profile information. These two features establish a check-in gradient where ownership can be evaluated on a spectrum as opposed to *foursquare*'s binary, here-or-not system.

Figure 3: On-site activation. Affordances of the marker keep it in place during and after activation.

Markers are created from litmus paper to measure the user's direct physiology. The diet and hormonal levels of a user, alter the acidity of the urine, and evoke different reactions from the marker. This replicates the unbiased profiles available in nature but not the digital world. Natural decomposition aids in the competition of maintaining your presence in a more dynamic fashion than the arbitrary 60 day limit of *foursquare*. Person-specific seeds are also embedded in each marker to implicitly impact the environment in the long term. In the future, these individualized seed-packets could be replaced with a uniform species of plant that is modified to include a custom genetic watermark which could more directly store, share, and spread a user's personal information and territorial claim.

Figure 4: a) Marker activation b) QR-code revealed and litmus changed c) Person-specific plant growth.

Concern has been voiced in the past about the ability of females to use the system. While certain cultures may unfairly shun females more than males from performing the actions required for "Mark Your Territory," they are also able to use the device in a squatting manner, with the aid of a peripheral such as the go-girl (www.go-girl.com), or by studying the standing techniques discussed in "A Woman's Guide on How to Pee Standing Up" [7].

Technical Details

The core functionality comes from the combination of a custom Android App with custom firmware running on an Arduino Mega ADK. This is a special microcontroller compatible with Google's recently released (July 2011) Open Accessory Development platform which can link real-world sensing and manipulation with entities in the digital world. To encourage explorations of this concept and its technical underpinnings, all aspects of code and design have been open-sourced, carefully documented, and made freely available at www.markyourterritory.org.

CONCLUSION

The prototype's initial demonstrations spawned a range of responses and design suggestions. It succeeds in posing questions concerning our relationship to "checking in" over a longer, biologically oriented timeframe. Most of all, it uses tangible and physical interaction to present an alternative design philosophy to the disembodiment that dominates the schema of current social media.
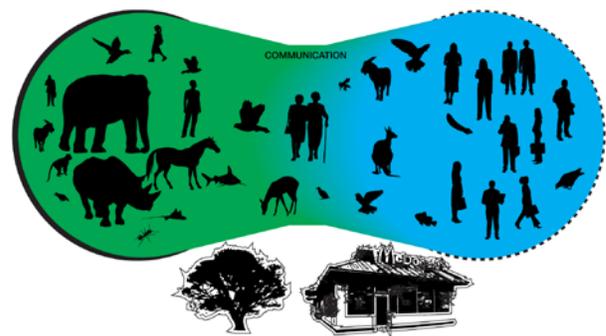

Figure 5: MYT's hybrid model for digital/physical data flow.

This alternative evolved from the inclusion of parallel animal behavior with digital media in order to explore a novel way of marking one's territory in a hybrid spaces. Given the plethora of other related behavior ripe for similar investigation, this kind of process- and behavior-based design, inspired by (but not blindly mimicking) animals, might offer a fruitful approach to tangible and embodied interaction design at large.

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BIOGRAPHY

Andrew Quitmeyer is a polymath adventurer interested in discovering new means of exploring and sharing our world. A fascination with science, nature, and the unknown lead him to his current work, designing and implementing computer-vision based animal behavioral research and

documentaries. As a Digital Media PhD student, he also develops techniques and tools for expressing ideas in engaging and powerful new ways. This research has taken him to the wilds of China, the islands of Galapagos, and the jungles of Panama. His trans-disciplinary, multimedia works have been featured in outlets such as PBS, NPR, Cartoon Network, Make Magazine, Wired, and Scientific American.

Dr. Michael Nitsche joined the School of Literature, Media, and Communication in 2004, and formed the Digital World & Image Group DWIG (http://dwig.lmc.gatech.edu/) shortly after. His research looks into digital spaces, where and how they intersect with physical environments. Combining video games, mobile technology, and digital performances, he experiments with borderline areas of digital and physical media. Michael holds a PhD in Architecture from the University of Cambridge and researches digital virtual worlds as environments for dramatic engagement and human expression. His work combines theoretical analysis and practical experiments and his collaborations include work with the National Film and Television School London, Sony Computer Entertainment Europe, Turner Broadcasting, Alcatel Lucent, and others. He is author of Video Game Spaces: Image, Play, and Structure in 3D Worlds (MIT Press, 2009), and has published on Game Studies, virtual worlds, digital performance, games and film, and machinima in numerous publications.

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