Forgotten Island: A Story-Driven Citizen Science Adventure

Nathan Prestopnik

Syracuse University

337 Hinds Hall

Syracuse, NY 13244 USA

napresto@syr.edu

Dania Souid

Syracuse University

325 Hinds Hall

Syracuse, NY 13244 USA

dsouid@syr.edu

Abstract

Forgotten Island, a citizen science video game, is part of an NSF-funded design science research project, *Citizen Sort*. It is a mechanism to help life scientists classify photographs of living things and a research tool to help HCI and information science scholars explore storytelling, engagement, and the quality of citizen-produced data in the context of citizen science.

Author Keywords

Purposeful Games; Social Computational Systems; Citizen Science; Design Science

ACM Classification Keywords

K.9.0. Games

General Terms

Design

Introduction

Forgotten Island is a point-and-click adventure designed to help life scientists taxonomically classify photographs of plants, animals, and insects. Part of an NSF-funded research project called *Citizen Sort*[1], It is a design science project where the theorization, design,

[1] http://www.citizensort.org

and evaluation of IT artifacts is a central element of the inquiry process [2, 3, 9]. In addition to being an engaging game that helps life scientists with their work, *Forgotten Island* is also a tool to help HCI researchers explore storytelling, engagement, and data quality in the context of social computational systems. The game is situated within the citizen science domain, where members of the public are recruited to participate in online scientific investigations [1, 15].

Design

In *Forgotten Island*, players take on the role of a lost explorer with a secret past. The player character, a young scientist and the rightful owner of the island, has been betrayed by DOC73R-CY3N53, an evil but none-too-bright robot. Formerly a good assistant to the player, DOC73R-CY3N53 is now intoxicated with power. His malicious plan: to reverse roles with the player and claim *Forgotten Island* for himself.

A mysterious explosion has destroyed the island's biology lab and scattered photographs of living specimens across the strange landscape. DOC73R-CY3N53, falsely accuses the player of planting the bomb and orders him or her to re-classify the scattered photographs and rebuild the island. Though suffering from a serious case of amnesia, the player agrees in the hopes of unraveling the mysteries of the island and rediscovering who they are.

Forgotten Island infuses this science-fiction mystery story and rich, immersive game world with a scientific activity: the taxonomic classification of plants, animals, and insects. As players interact with characters and explore the island, they must also reclassify the ruined laboratory images – in actuality, scientific photographs

Forgotten Island's game world is a mysterious island that the player explores and rebuilds while undertaking citizen science classification task. The game world was drawn by hand to achieve a "comic book" feel and visually cue the player that the game will be a lighthearted and whimsical story experience.

of living things captured by biologists from around the world. *Forgotten Island* seamlessly integrates taxonomic classification into the larger narrative. The player uses an invention called the "Atomic Classifier" to re-classify the scattered biology lab photos. For each classification, the player is rewarded a small amount of game money that can be used to purchase equipment from ED-D, a child-like robot who runs the island's only store. It is up to the player to decide when and where to use the Atomic Classifier, but classifications are necessary to make progress in the game. The taxonomic classification data that players generate helps to advance research in the life sciences. Players sort large collections of unclassified photographs into smaller and more workable collections organized by taxonomic characters and states (attributes and values).

Players experience the game story through comic book interactions with various characters. Each interaction advances the plot, finishing with a tacit promise to the player that upcoming interactions will be as engaging as previous ones. Investing players in the story, characters, and game world is critical to making a story-driven purposeful game successful. Accordingly, players classify fewer photographs in early parts of the game. As the game progresses, the need to earn money becomes more pressing. Approximately 160 photos must ultimately be classified to conclude the game and defeat DOC73R-CY3N53.

Theory and Precedent

Louis von Ahn's reCAPTCHA [14], the ESP game (an image tagging system) [13], Phetch (which produces accessible descriptions of images) [12], and TagATune (where users tag music clips) [4] were important

Forgotten Island's "Atomic Classifier," a device used by the player to classify photographs of living things. Photographs are shown to the player along with a series of questions and possible answers (characters and states). Life scientists prepare the questions and answers based upon their research requirements, and player classification data is returned to them via a back-end system.

design precedents for *Forgotten Island*, demonstrating various ways to turn purposeful activities into games. These primarily capitalize on what Malone [8] refers to as the "love" form of motivation, where players have an altruistic interest in helping out. However, for many players, helping scientists is appealing in the abstract, but can easily begin to feel like work without additional mechanisms for engagement. *Forgotten Island* places classification in the background of the game. It is just one element in a rich and diverse world of things to do.

Malone [5-7] writes of heuristics that engage learners as they play, including the use of fantasy elements. *Forgotten Island* adopts these elements in its characters, environment, and game-play, seeking to sustain players through multiple interactions with science tasks that are not inherently engaging.

The notion of video games as experiences was adopted from [11]. *Forgotten Island* engages players by presenting them with an immersive story and world to interact with. This gamification approach is rare; it demands a great investment of time and resources on the part of the game developers. However, story-driven purposeful games have the potential to create more meaningful experiences for players [10].

Two classic point-and-click adventure series, *Monkey Island* (1990-2011) and *King's Quest* (1984-1998) were also an inspiring reference point. These games' reliance on story and puzzle-solving fit the scientific goals of *Forgotten Island* in a way that shooting and fighting games did not. *Monkey Island* and *King's Quest* execute characters, story, and locations extremely well.

Evaluation

Evaluation of *Forgotten Island* is ongoing. During development, formative evaluations helped to balance and improve the design of the game. 25 individuals provided feedback on the story, characters, and science, helping the design team to tune the game economy so that players were neither asked to do too many or too few classifications.

A field study is also in progress. Players have been recruited from citizen science and gaming websites, and their activities in the game are aggregating into a sizeable data set that will be evaluated on a variety of metrics. In addition, the *Citizen Sort* system is designed so that players can be asked about their participation in surveys or interviews.

Finally, the *Citizen Sort* research team is preparing a controlled comparison of *Forgotten Island* to *Happy Match*, a points-based game that is also part of the *Citizen Sort* project. The goal is to explore how story impacts players' willingness to continue classifying photographs vs. more traditional gamification approaches. This experiment will rely on subjective player responses as well as physiological sensors (fNIRS, EEG, etc.) to build a holistic picture of what players experience in the two games.

Conclusion

Story-driven purposeful games are rare, though story is a common element of many entertainment games. *Forgotten Island* demonstrates a powerful model for how stories can frame scientific activities, making them more interesting and enjoyable for players. The *Forgotten Island* model is generalizable, and may be applied to additional scientific or learning activities.

Forgotten Island is web-based and available to play online. A free *Citizen Sort* account is required and can be created at www.citizensort.org. *Forgotten Island* runs in modern, flash-enabled web browsers.

References

[1] Cohn, J.P., Citizen Science: Can Volunteers Do Real Research? *BioScience*, 2008. **58**(3): p. 192-107.

[2] Hevner, A.R., March, S.T., Park, J., and Ram, S., Design Science in Information Systems Research. *MIS Quarterly*, 2004. **28**(1): p. 75-105.

[3] Hevner, A.R., A Three Cycle View of Design Science Research. *Scandinavian Journal of Information Systems*, 2007. **19**(2).

[4] Law, E. and von Ahn, L., *Input-agreement: a new mechanism for collecting data using human computation games*, in *Proceedings of the 27th international conference on Human factors in computing systems*. 2009, ACM: Boston, MA, USA.

[5] Malone, T.W., *What makes things fun to learn? heuristics for designing instructional computer games*, in *Proceedings of the 3rd ACM SIGSMALL symposium and the first SIGPC symposium on Small systems*. 1980, ACM: Palo Alto, California, United States.

[6] Malone, T.W., *Heuristics for designing enjoyable user interfaces: Lessons from computer games*, in *Proceedings of the 1982 conference on Human factors in computing systems*. 1982, ACM: Gaithersburg, Maryland, United States.

[7] Malone, T.W. and Lepper, M., *Making learning fun: A taxonomy of intrinsic motivations for learning*. Aptitude, learning, and instruction: Vol. 3. Cognitive and affective process analyses, ed. R. Snow and M. Fair. 1987, Hills-Dale, NJ: Erlbaum.

[8] Malone, T.W., Laubacher, R. and Dellarocas, C.N., *Harnessing Crowds: Mapping the Genome of Collective Intelligence*, in *MIT Sloan Research Paper No. 4732-09*. 2009.

[9] Prestopnik, N., Theory, Design and Evaluation – (Don't Just) Pick Any Two. *AIS Transactions on Human-Computer Interaction*, 2010. **2**(3): p. 167-177.

[10] Salen, K. and Zimmerman, E., *Rules of Play: Game Design Fundamentals*. 2004, Cambridge, MA: The MIT Press.

[11] Schell, J., *The Art of Game Design: A Book of Lenses*. 2008, Burlington, MA: Elsevier, Inc. 483.

[12] von Ahn, L., et al., *Improving accessibility of the web with a computer game*, in *Proceedings of the SIGCHI conference on Human Factors in computing systems*. 2006, ACM: Montreal, Quebec, Canada.

[13] von Ahn, L., *Human computation*, in *Proceedings of the 4th international conference on Knowledge capture*. 2007, ACM: Whistler, BC, Canada.

[14] von Ahn, L., *Human computation*, in *Proceedings of the 46th Annual Design Automation Conference*. 2009, ACM: San Francisco, California.

[15] Wiggins, A. and Crowston, K. From Conservation to Crowdsourcing: A Typology of Citizen Science. in *44th Hawaii International Conference on System Sciences*. 2011. Kauai, Hawaii.