Designing and Building Mobile, Locative Games with ARIS

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Abstract: This proposed workshop will introduce participants to ARIS, a platform that allows non-programmers to create their own mobile, locative augmented reality games and activities. Through demonstration, hands-on participation, and reflective discussion, participants in this one-hour workshop will leave with: 1) connections between situated learning, mobile technologies, place, design, and games, 2) possibilities of using augmented reality games to create new learning opportunities with mobile devices, and 3) their own sample ARIS game that includes both narrative and data-gathering elements. This proposal discusses the ARIS platform and its theoretical foundations as well as the goals and activities of this ARIS workshop.

Introduction

The ubiquity of smartphones poses challenges for classroom management, but more importantly, opportunities to create deep learning experiences in new ways. We developed ARIS as a practical way for non-programmers to use mobile devices to bring together ideas from situated learning, games, place-based learning and design-based learning to do just that. Over the last three years, a wide variety of people have taken up this challenge, producing diverse curricula and games, and we want to keep bringing new groups into this exciting world of place-based mobile game design. In the proposed workshop, we will play through an example ARIS game that includes a light narrative line and data-gathering component. We'll step through the design of a simple game using ARIS (aris-games.org), a drag-and-drop browser-based game platform. Bring a laptop for hands-on design, an iOS device to play. Or just come to discuss what a future of experiential education may be like.

Through demonstration, hands-on participation, and reflective discussion, participants will leave with: 1) connections between situated learning, mobile technologies, place, design, and games, 2) possibilities of using augmented reality (AR) games to create new learning opportunities with mobile devices, and 3) their own designed ARIS game that includes both narrative and data-gathering elements.

Theoretical Framework

The design of ARIS has been heavily influenced by theories of situated learning (Brown, Collins, and Duguid, 1989; Lave and Wenger 1991), games and learning (Gee, 2003 ; Squire, 2006) and place-based learning (Gruenewald, 2003; Ellsworth, 2005).

Mobile technologies have showed promise in shaping how we think about learning and the design of learning environments (Squire, 2009; Squire & Dikkers, 2011). Educational researchers have examined a number of transformative uses of mobile technology, and one of the most promising is augmented reality (e.g. Squire & Klopfer, 2007), where virtual data or representations are coupled with real world locations and contexts. In this early research, a number of scholars probed how location-aware mobile devices may be used to engage a unique form of educational video games (Klopfer, 2008). This line of research has not only developed ideas for how to create more meaningful educational experiences, but also made progress toward understanding how mobile technologies make other pedagogical advances practically possible; for example, problem-based (Barron et al., 1998) and place-based learning have proven difficult to instantiate within traditional classroom settings, but show promise through mobile technologies. Specifically, a variety of mobile learning designs, such as environment simulation (Klopfer & Squire, 2008), design literacy (Mathews, 2010), and scientific literacy and argumentation (Squire & Jan, 2007), have demonstrated favorable results.

Yet, like a lot of inspiring educational research in this area, this innovative academic research was somewhat limited in scope and has spread far more slowly than the vast cultural changes brought about by modern technologies. To understand what new, undiscovered capabilities mobile offers for teaching and learning requires broad experimentation around the basic functionality of mobile devices.

Therefore, we joined the effort to create software and pedagogy that has the capacity to have a transformative effect and is capable of scaling in new ways. In the case of mobile learning, we need a way for the masses to begin exploring the educational affordances of using mobile technology to restructure our relationship with place. Additionally, we believe that mobile technology has inherent technological affordances and ecologies of use that

are capable of generating new types of learning environments and interactions worth exploring.

By using these ideas to design an accessible mobile augmented reality platform, ARIS, we have opened the world of mobile learning experimentation and design to a diverse audience, allowing students, artists, classroom teachers, and educational researchers to participate in the creation of new worlds at our fingertips.

ARIS Platform

ARIS is an easy-to-use, open-source development platform that allows anyone to create locative mobile games and activities for formal and informal learning environments. Locative virtual tours, interactive cases, situated documentaries, or data collection activities can be authored in a browser-based drag-and-drop editor, then "played" on iOS devices. We expect that anyone interested in mobile learning, locative meaningful play, or designing narrative- or data collection-based activities will find this workshop relevant.

Open Source

In addition to being a useful tool, ARIS also exemplifies how an open-source model can be used to cultivate, scale and sustain educational innovation at large. In addition to using open-source licensing, the ARIS project is built around an ethos of easy entry, collaboration and distributed participation. Because the ARIS platform is designed for non-programmers, it allows a wide-range of users to quickly and easily build their own mobile-based learning activities and experiments. The resulting community of users, which currently includes over 4,800 authors and 10,000 unique designs, continues to grow and cross-pollinate, especially as more domains and research perspectives are being represented. In addition to sparking the development of new ARIS features and functionality, this diverse user group has collaborated to develop new methods of enacting and researching mobile-based learning.

Our main goal with ARIS is to mainstream experimentation with the creation and play of mobile augmented reality games and activities, largely across a variety of learning contexts from classrooms to museums to the great outdoors. So, we want the authoring tool to be as easy to use as possible by teachers, students, and researchers alike. We want the client, by leveraging the device's ability to connect to and make sense of the outside world, to provide a powerful and transparent means of interacting with these game worlds. Finally, ARIS is not intended to be a finished product, but something that grows out of communication surrounding its own use. Accordingly, we want ARIS to expand and deepen the repository of viable mobile learning experiences by drawing from growing bank of use cases to steer its growth, development, and our own understanding of how mobile technologies and augmented reality can be used to achieve learning goals.

ARIS itself is very much a product of the iterative process of design-based research (Brown, 1992; Design Based Research Collective, 2003). We've specifically designed ARIS as a prototyping tool by offering users a simple on-ramp to quickly design games and activities and get them working in a rough form. Not only does this jump start the iterative design process, but it also allows for early playtesting, so that something can be learned from real-world use. Novice authors can get a simple narrative-based game playable in less than an hour and a data collection style activity for even as fast as one minute for a data collection style activity.

Partly, we have been interested in this because we really enjoy making augmented reality games and want to share that joy as broadly as possible. But this project is also motivated by several converging threads of educational thought and research, many questions whose answers seem to lie within enabling large-scale, grass roots experimentation with the creation and play of mobile augmented reality games.

Features

The ARIS platform consists of a web-based editor (see Figure 1) for authoring games, an iOS client app (see Figure 2) for players to interact with games, and a server (LAMP) running in a cloud-based environment with which both the editor and iOS client communicate. In this sense, ARIS games are "server-based", not requiring additional actions to become published.
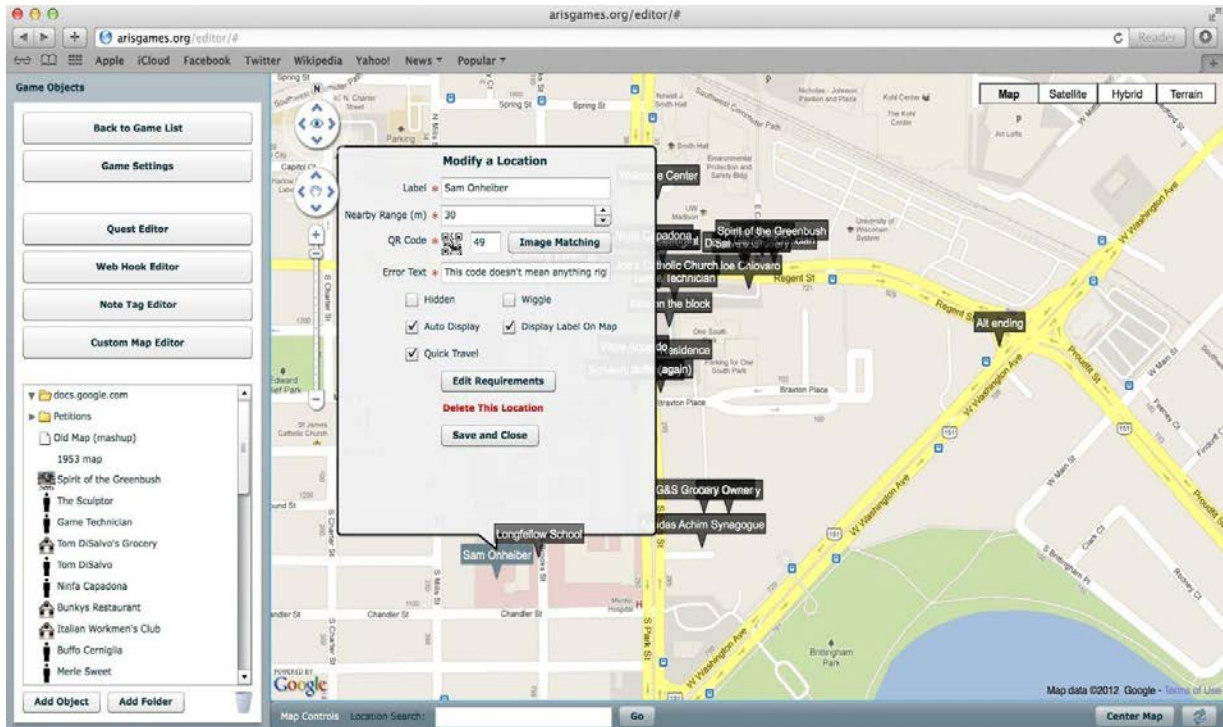
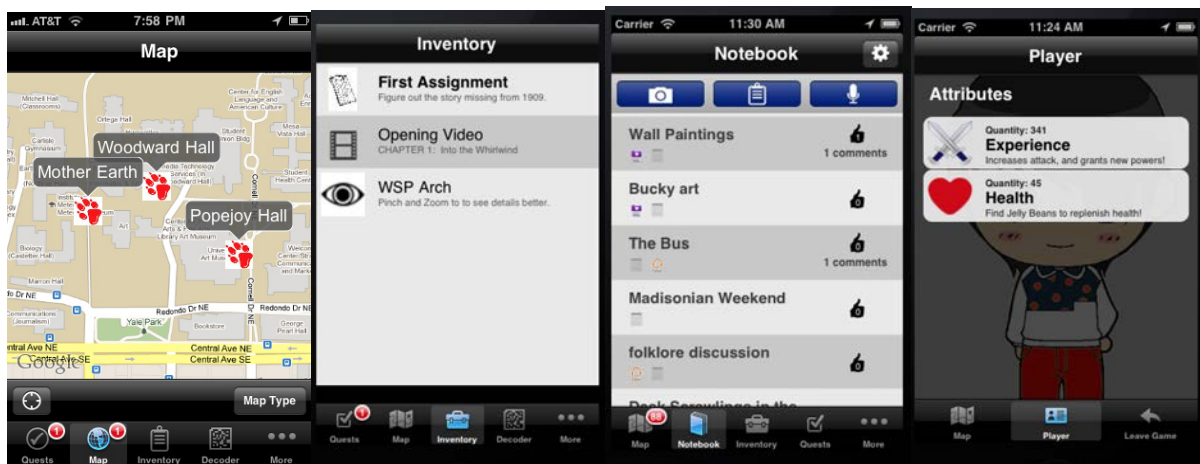**Figure 1. ARIS web-based editor in which authors create games.**

Figure 2. ARIS iOS client application Map View, Inventory View, Notebook View and Player Profile View.

The client provides players with access to play any games that have been authored by anyone using the editor. Players can look for games near their current location, by popularity, or by title search.

The main interface of the client is organized by several tabs. *Quests* is used to give the player contextual information about what they have done and what they can do next, the *map* displays a player's location, a rendered map, and the locations of game objects. Other tabs include a *decoder* (QR codes, bar codes, manual entry), player *inventory*, player *attributes*, and the *notebook*.

The player navigates through game play either using the *map*, *decoder* or a combination of the two. Most commonly, the map is used for outdoor games, while the decoder is used for indoor games. When the map is used, game objects will appear on the map according to the requirements set by the author of the game. When the decoder is used, the game objects are displayed in the actual environment as a QR code for players to scan and, similarly, their interaction is based on the requirements set by the author of the game. Furthermore, as part of gameplay, players unlock new *quests* that give them goals to complete in the game. Quests often include visiting certain characters in the game or adding specific items to the player's inventory, but can be much more complex.

In an ARIS activity, the game space consists of virtual objects overlaid onto real-world places and spaces. There are several different types of virtual object possible. *Plaques* are the simplest ARIS objects; they are pieces of information (text and media) located in space. Simple virtual tours are made by simply creating a few plaques and placing them appropriately in the world. *Items* are objects that ARIS players can pick up and take with them. Items can be picked up off the map, given to a player by characters in the game, and created by the player. The *player's inventory* displays all the items the player currently has. Likewise, the player can also be given attributes in the game, such as health, experience, etc, which is logged in the *player's attributes*. Finally, characters afford virtual dialogue with players via a "hub-and-spoke" method similar to that used in games like Mass Effect. Characters can also interact with player's inventories in these bits of dialogue, giving them items or attributes, or taking them away.

All of the plaques, characters, and items in ARIS games can be linked to real world locations; players can access them by being within a specified distance of a location (detected through GPS) or by scanning a QR code with the decoder. Game designers can also enable "quick travel" mode for any object, which overrides the location-specific requirements of that object, so that the player can interact with it from afar.

In addition to these core objects (plaques, characters and items), there are several features that allow for more complex games. First, the fact that ARIS is server-based allows games to become multiplayer virtual worlds, where interactions by one player in the game can affect other players. For example, items can be limited in number, where one player picking up an item may make it unavailable to another player. Players can also trade items with each other, allowing for the creation of virtual economies.

The *notebook* feature takes the idea of a shared virtual world in another direction. It allows players to create and share video, photo, audio and text content with other players of the same game. It is used to create data collection activities where the emphasis is on players' interactions based on what they discover and document in the world rather than what has been created for them by the author.

There are also features that allow for further variety in design using these basic objects. Rather than objects being placed individually at locations, authors can create items or characters that *spawn*, appearing within a specified radius of a player or given location at a specified rate. In this way, authors can create games where players' options are determined algorithmically. Authors also have the ability to create their own *custom maps* that appear or change during the game, overlaying Apple's iOS maps. This allows fictional or informational backdrops to the designed game world to be created and even to change in response to player actions. In a similar vein, *panoramic views* that overlay custom digital information onto the physical space when looking through the camera afford camera-based augmented reality without requiring the authors to have much technical skill.

Finally, authors can create HTML5-based web applications and place them at a location within the game, like any other object. With this feature, authors are not limited to creating game content via the ARIS editor. With a bit of programming skills, authors can design any web-based content and embed it into the game directly. This includes mini-games, simulations and even programs that manipulate the way ARIS functions. Not only does this allow for authors to create any kind of interactive content, it also affords the possibility for custom, high-end game production using ARIS as the base.

Workshop

This proposed workshop will introduce participants to ARIS, discussing what can be done with the platform and the kinds of games and activities that are typically built. The workshop will be hands-on, where participants see a situated documentary ARIS game, then spend the bulk of the workshop creating their own mobile, locative game. Participants will need to bring a laptop for hands-on design and an iOS device to play their games.

Goals
Through demonstration, hands-on participation, and reflective discussion, participants will leave with: 1) connections between situated learning, mobile technologies, place, design, and games, 2) first hand experience of some possibilities of using augmented reality (AR) games to create new learning opportunities with mobile devices, and 3) their own designed ARIS game that includes both narrative and data-gathering elements.

As typical in a design activity, we harness collaboration and peer-to-peer mentorship. About 90% of this session is dedicated to hands-on experience using ARIS, thus participants will be guided through a design process. ARIS is a user-friendly platform and community; often participants with more experience with technology begin to help those who may shy away from it, so that by the end of the workshop all participants increase in understanding the process both as teachers and learners.

Significance

At GLS 5.0 in 2009, the ARIS authoring tool was first revealed, allowing anyone to design and build their own augmented reality games. By the time of this workshop for GLS 9.0, version 2 of the ARIS editor will be we'll underway and the workshop will be able preview what is in store. The new authoring tool will be a full re-design, allowing designers to more efficiently build their designs. It will move from Flash to HTML5, allowing game authors to design on tablets as well as desktop and laptop computers. It will also incorporate new features, like a visual timeline-based quest editor and the ability to create custom maps. Finally, in conjunction with the new authoring tool, we are developing a new process for designing games in ARIS, including supports for developing storyboards and designing interactions with characters. With the new authoring tool, new design process and new features, GLS 9.0 is an ideal time for an ARIS workshop both for participants new to the ARIS platform as well as to existing users.

Activities and Timeline

This hands-on workshop will focus on creating a narrative-driven data collection-based activity with mobile devices. During this session we will give a brief overview of the ARIS platform, playing through a brief game and show how that game is built. Then, during the remainder of the two hour workshop, participants will build an ARIS project that employs two learning activities: 1) a narrative-driven tour, and a data collection-based activity (inquiry-driven field research). As a result, participants will gain a foundational and practical understanding of how ARIS can be used to design and implement meaningful activities in a variety of contexts.

Timeline:
- 15-minutes: Introduce ARIS
- 45-minutes: Participants (in small groups) are led through the steps to create the components of a situated documentary in ARIS.

ARIS has been used in a variety of formal and informal learning environments and content areas, including science, folklore, art, second language, physical education and history. This platform harnesses place to play a meaningful role in learning, whether it be to produce curricula or as a design/prototyping tool for students. Participants will leave the workshop both with a technical understanding of ARIS, and with an inspiration to push the boundaries of learning through mobile locative activities.

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