Research Proposal: Extending ARIS for Greater Collaborative Potential

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INTRODUCTION

Project ARIS is an open-source augmented reality engine. Applications developed in ARIS are played in the real-world with devices running iOS (iPhone/iPad) through the use of GPS functionality of the device and QR codes to trigger events based on the location of players. The engine can be used to make games, tours, and interactive stories.

ARIS has three three layers of participation: Developers create applications. Facilitators bring together people to participate in the application. Users are the participants in the application. The relationship between these actors is loose—Developers and Facilitators can be the same people—but importantly users have limited ability to contribute to the world; Aside from interacting the application story, Users can only add to the world through dropping items on the ground.

ARIS gives a wide breadth of design options for creating complex applications. One constraint in the game is that the content, once created, is static. For example, if a designer places a Plaque (a permanent item in the game containing media for players to view), the information contained in the item is set until the designer changes it at a later time. Another constraint is the lack of in-game communication options. While players in the same physical space are able to communicate face-to-face, no mechanism exists for users to communicate directly in the game. This is a component which would have value for users separated by a large distance. Furthermore, facilitator-to-user communication is not possible. Both these issues speak to the fundamental static nature of ARIS applications: static content which does not allow for dynamic communication.

Research Question

Our research question is twofold: First, what mechanism could be implemented in order to add dynamic communication and content to ARIS applications to increase the capability of Users, Facilitators, and Developers? And second, in what ways will participants utilize this mechanism beyond the original design intention? i.e. what actions will emerge from this mechanism?

TECHNICAL COMPONENTS

Development

Our group intends to develop more collaborative component(s) into the existing ARIS platform to facilitate greater collaboration and teamwork amongst participants during ARIS game sessions. During individual game sessions, you may see the participants collected together into teams around one device with the game running. This gives the people in the immediate vicinity the ability to collaborate and exchange ideas in their own group, but not with the several other teams that are also playing the game and are a distance away. ARIS currently lacks any sort of collaborative elements and our teams hope is to add them, thereby increasing ease of use of the game, making it more enjoyable, and benefiting the total learning experience (given that the app itself is often used as teaching tool).

While we are only in the initial phases of the project, we have isolated two major options to adding as a collaborative component to the game: Twitter integration and web-based chat. Which one is chosen will depend on the design feasibility. In the case of this project, the optimal choice will be one which can be completed in the time frame (as opposed to the best addition).

Choose Existing Services

The ARIS app itself exists as a type of gamemaker type tool, facilitating creation of games around topics chosen by developers. A developer can use a web based GUI to plan aspects of the application ranging from characters, items, or plaques (upon which useful information is kept). This system allows those without the iOS development background to easily create complex applications. Furthermore, JavaScript can be embed several facets of the game which we should be able to use to implement a collaborative component.

The benefit of a chat room is it would allow free flow of discussion amongst teams regarding strategies and gameplay elements. Twitter integration would allow Players, Facilitators,

and Developers to update content in game which would normally be static. This could allow for person-to-person and broadcast communication.

Twitter has an advantage since it is a stable microblogging service and would perfectly suit the needs of providing short, quick updates that are critical to an applications success. Additionally, Twitter provides their own API for interaction and due to large community support and popularity of the microblogging platform, we hope implementation will be straightforward. However, Twitter requires an authentication procedure which may be beyond the capabilities of the ARIS platform. We will be investigating the complexity of this option early in our research.

Twitter may seem like a strange choice for adding a collaborative element but an argument can be made that the the services constraints–only allowing users to post 140 characters–do not restrict any specific use on the user. As a result, Twitter has been used in many interesting ways.[1] With this in mind, Lee and Paine stated that "[c]oordinated action can still be conceived of as people working together toward a shared goal. But shared goals can be very diffuse and ill-defined and we also see that working together may sometimes feel more like a series of fleeting microblog exchanges or people working rather separately on different systems that still need to interoperate with a larger, sprawling infrastructure."[19] This points to the use of Twitter as a mechanism for enabling collaborative.

For the chat room option, we would create a simple webpage with HTML/CSS, JavaScript, and Node.Js to create a webpage where Users could login during a session. Then JavaScript running on the ARIS client can communicate with the chat page appropriately to send and receive messages. The issues inherent to chatroom design are numerous. Without an authentication system the chatroom could be compromised (spam or even malicious attacks). Furthermore, developing a server based application is a large task and may be beyond the feasibility of this research project.

Development

The ARIS platform has the ability to run JavaScript throughout many components of the game. Individual items, permanent game components (plaques) dropped by Developers, and Player menus can all run JavaScript and this code can interface with the system through the system API. For example, JavaScript can be used to increment/decrement items owned by a Player. The full scope of the ARIS API must still be researched but we are confident we can leverage this feature to implement our addition to the system.

Challenges

Some of the technical challenges we foresee with this project is our inexperience with iOS development, learning the ARIS platform, developing for an iOS specific app with limited iOS device access, and appropriate security measures to ensure external misuse doesnt happen through Twitter or our chat room service. On combating those risks, we expect to have to do limited development on the iOS platform for this project, so any required iOS development will be small.

Another hurdle is our development process is inexperience with the ARIS platform itself. In terms complexity the ARIS platform is medium to high–large code base but well documented API. Consequently, we will need to spend significant amounts of time researching the platform to gain greater intuition about what is actually possible to developed in the game.

We have already started working with the ARIS platform and will be present at the ARIS Game Jam on the weekend of October 23rd to learn and gain familiarity with Developers and their usage of the platform.

METHODOLOGY

This research consists of the development and implementation of collaborative game elements for the ARIS platform. As design-based research, specifically Peffers et al.s Design Science framework will be employed. This methodology consists of six activities to progress through the research process:

- Problem identification and motivation. Define the specific research problem and justify the value of a solution.
- Define the objectives for a solution. Infer the objectives of a solution from the problem definition and knowledge of what is possible and feasible.
- Design and development. Create the artifact, and include knowledge of theory that can be brought to bear in a solution.
- Demonstrate the use of the artifact to solve one or more instances of the problem.
- Observe and measure how well the artifact supports a solution to the problem.
- Diffuse the resulting knowledge. [22]

Although created for Information Systems, this methodology lends itself well to other research domains. The ARIS platform is primarily used within the context of creating pedagogical resources and games. Regarding educational research and the need to make improvements in this domain, Reeves proposes, "that progress in improving teaching and learning through technology may be accomplished using design research as an alternative model for inquiry."[23] Additionally, within the context of educational design research, Reeves, Herrington and Oliver parallel five of Peffers et al.s activities when describing the benefits of Design Science:

> One of the primary advantages of design research is that it requires practitioners and researchers to collaborate in the identification of real teaching and learning problems, the creation of prototype solutions based on existing design principles, and the testing and refinement of both the prototype solutions and the design principles until satisfactory outcomes have been reached by all concerned.[24]

[1] http://www.wired.com/2015/10/lori-hepner-twitter-portraits/?mbid=social_twitter

The problem our research will address is a lack of collaborative game elements within the ARIS platform. Although what we propose may not appear to address a pedagogical issue, effective collaborative learning is central to pedagogy and therefore our aim is pertinent.[14] Furthermore, the use of Augmented Realities draws on situated learning theory and will therefore be central in the design and development stage of our research. Dunleavy and Dede affirm that "[s]ituated learning theory posits that all learning takes place within a specific context and the quality of the learning is a result of interactions among the people, places, objects, processes, and culture within and relative to that given context."[3]

The platform has been used to create systems for a variety of learning contexts; for example science, art, history, and language learning.[7, 11, 27, 3] The ARIS community includes a wide range of users, such as, "artists, educators, game designers and story tellers,"[18] many of which are using it for educational purposes because it is user-friendly, and includes an online community to address questions and feedback.[27] The community itself is also collaborative; the platform is open source, and members connect through Google groups, Google hangouts, and Global Game Jams. However, the ARIS platform itself lacks collaborative game elements. Holden addresses this limitation of ARIS and explains the constraints of the system:

- Locks, the logical glue in ARIS, largely respond to what an individual player has done or has in possession. The world is largely not shared between players.

- Players cannot easily interact with each other in ARIS. We used to have a cool "trade" feature, but Google bought it and shut it down.[10]

To address this, and fittingly our motivation for this research, we propose the implementation of real-time communication or the use of social media within the ARIS platform. Although the community has expressed interest in collaborative game elements, Rogers addresses that "[g]etting a new idea adopted, even when it has obvious advantages, is difficult."[26] However, given that social media integration is by no means a new concept within a pedagogical context, this may help facilitate the process.

Rogers defines the diffusion of new ideas by the following elements: "(1) an innovation (2) that is communicated through certain channels (3) over time (4) among the members of a social system."[26] Once the technical components of our proposed collaborative elements are addressed and developed, we will distribute these to the members of the ARIS community via the available channels: Google groups, Google hangouts and the Global Game Jam. We will also circulate a pre and post questionnaire seeking feedback regarding our proposed collaborative elements, with follow up interviews to shed further light on any potential implementation. ARIS users also share their games within the community and these could potentially be examined, and/or play-tested to see how the elements were incorporated. The limited time available for this research is likely the greatest risk.

Therefore, if time constraints prove to be an issue, we then propose to create a game in ARIS and incorporate the new feature(s). This system will then be analyzed from the user/players point of view by means of a mixed-method approach: a case study analysis with data collected via pre and post questionnaires, a focus group, and field observation. A mixed-method approach allows for a more comprehensive study, as Easterbrook et al.s state, "[a] variety of methods can be applied to any research problem, and it is often necessary to use a combination of methods to fully understand the problem."[4] McGrath reiterates this same notion: "[i]f you use multiple methods, carefully picked to have different strengths and weaknesses, the methods can add strength to one another by offsetting each others weaknesses."[21] This highlights the strength of triangulation, which will include using several research methods to validate our data by cross verification of multiple sources.

MILESTONES

Deadline	Deliverable (complete by date)
Oct. 23/24	
	ARIS Game Jam (Survey)
	Code Feasibility Deadline
Nov. 4	
	Oral update on project progress (in class)
Nov. 13	
	Interim project reports
	Distribute Completed Code to Community
	Implement and Distribute Community Survey
Dec. 3	
	Analyze Survey Data
	In Class Presentation
	Project final reports

EXPECTED RESULTS

Since JavaScript can be embedded within characters, items, and components called plaque (in game items which reside permanently in spaces), it is conceivable the communication service we implement could be used for:

- A broadcast method for game facilitators to contact players in game. e.g. everyone meet here at this time.
- Embedding dynamic information into the game. e.g. plaques can change state even after being placed. (Similar to the ancient Roman Acta Diurna[2]).
- Item giveaways. e.g. players receive an item for retweeting for ARIS developers Twitter account.
- Player discussion via a pseudo forum environment. e.g. commenting on a broadcast by game facilitators.

Furthermore, we expect the community to come up with novel uses for the tool we create beyond the original design parameters. The power of Twitter seems to come from the emergent behaviour which spawns from the simple capabilities of the service. In the same vein we expect community members to take our service, get creative and do interesting things.

[2]https://en.wikipedia.org/wiki/Acta_Diurna

CONCLUSION

Augmented Reality technology is on the rise as we advance in technology. Project ARIS is an open-source platform for developing iOS Augmented Reality games, with a primarily pedagogical focus. While ARIS has proven to be a great success, we feel like it can be improved. With the theme of our course CSCW (Computer Supported Collaborative Work), knowing all the benefits and necessities of collaboration, we will work on integrating a communication method into ARIS for players to participate in the games they play more actively.

Our planned implementation is either integration with Twitter or create a chat room function for the game. We firmly believe that by having these services, user experience of ARIS will improve. The idea behind Augmented Reality is the imitation of the real world, which inevitably include human-to-human interaction. However, the state of ARIS right now does not have a platform for such interaction. By implementing the proposed solution(s), we aim to enhance user experience by allowing user-to-user communication directly in the application.

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