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More than Me

Exploring Educational Possibilities through Multiplayer Location-Based Augmented Reality Games

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Abstract

Prior work on location-based augmented reality (AR) games demonstrates that even in simultaneous single-player games, in which non-networked mobile devices run independent parallel instances of a particular game, players can have meaningful educational outcomes. However, technical constraints of single-player modes constrain AR players' role, peer, and team interactions, tasks within the game world, and place-based investigation. A digitally connected multiplayer game enables more nuanced, collaborative experiences by connecting players to a *shared* virtual world in which players communicate and coordinate across both physical and digital space, make choices affecting peer-players and the overall game state, and negotiate among limited virtual resources and shared spaces in the physical world. This poster describes the initial release of TaleBlazer multiplayer, outlines the rationale for its design affordances, and proposes future research around educational gameplay and game creation of complex location-based multiplayer AR games.

Background

Location-based augmented reality (AR) game platforms, such as ARIS, FreshAiR and TaleBlazer, track the current location of the player's mobile device's using GPS, QR codes, or other technologies, and provide digital content (e.g., interactions with NPCs, virtual objects, and digital information) based on the player's real-world location. These immersive experiences leverage the interplay between the real and virtual, enabling game designers to craft experiences that integrate the real-world environment, including its landscape, natural elements, human artifacts, or history, into the overall gameplay experience (Klopfer & Sheldon, 2010; Holden et al, 2013).

Instructional Approaches in Single-player AR

Early work in AR games demonstrates how even single-player mobile AR games, which run their own non-networked instance of the game, offer meaningful social affordances as players coordinate and share information (Klopfer, 2008) and develop scientific argumentation skills (Squire & Jan, 2007). More broadly, researchers evaluating the educational applications of such AR games (Wu et al, 2013) classify three instructional approaches (roles, location, and tasks) where alignment across the technology, instructional approach, and learning experiences can promote educational outcomes. For

example, in Environmental Detectives (Klopfer, 2008), game designers create an immersive experience around investigation of a fictional toxic spill in which players take on a distinct role (e.g., a toxicologist) and investigate a specific location (e.g., a chemical spill on a college campus) through specific actions or tasks (gathering and interpreting virtual quantitative and qualitative information). Within AR games, collaboration and discourse among players can be vital to gameplay, enabling players to compare information, make decisions and more broadly to externalize their thinking and deepen engagement. Yet single-player modes may not offer players experiences which mirror more complex, real-world experiences such as communicating among a distributed team, sharing resources or allowing roles to perform unique tasks which impact each others' game worlds.

Educational Affordances of One-World Multiplayer AR

The TaleBlazer team drew inspiration for its addition of multiplayer from two sources: prior work by the MIT research team as well as multiplayer features in other AR toolkits. First, researchers considered two examples of MIT's prior work in which AR mobile game players were interconnected via a shared virtual world. In Outbreak @ MIT, players collectively sought to contain a potential disease outbreak while sharing limited virtual resources (Rosenbaum, Klopfer & Perry, 2007). In POSIT, players attempted to collect relevant information to sway public opinion on the hypothetical construction of a controversial Biosafety Level 4 research facility (Klopfer, 2008). The technological infrastructure of both games allowed players to impact their peers, collectively helping (or obstructing) one another (e.g., by sharing or hording resources, spreading or containing a contagion). These games also engaged with topics (social exchange of information and disease spread) that aligned well with highly interconnected peer and virtual NPC engagement. The TaleBlazer team also observed ways in which other AR toolkits such as ARIS enabled game designers to author multiplayer games, connecting peer-players to a shared server-based game world (Holden, 2015).

Design & Technical Considerations of Multiplayer AR

The single-player version of the TaleBlazer toolkit (upon which the multiplayer version is based) utilizes a block-based scripting language, enabling games to embed a relatively high degree of interconnected components. In addition to making simple point-to-point games, TaleBlazer designers can make games based on underlying models, a style which fits well with complex subjects such as ecology or economics. Thus, when the team sought to develop a first iteration of a multiplayer version of TaleBlazer, it extended its block-based scripting language, enabling game designers to include interaction between players, teams, and the overall game world.

Similar to ARIS, the multiplayer version of TaleBlazer utilizes a client/editor/server architecture (Holden, 2015) and initial work on the TaleBlazer multiplayer platform focused primarily on creating a technical infrastructure that enables players to reliably connect via an instance code to a centralized server maintaining a single multiplayer instance of a game. On the mobile portion of TaleBlazer, additional multiplayer UI elements enable players to communicate and coordinate via in-game text-based team or whole group chat, make decisions that affect peer-players (e.g., team traits, inventories, scores and goals), and negotiate among limited virtual resources (peer 'give' action). Players' roles across a team also enable division of information or gameplay, dividing both the virtual space as well as the physical environment.

Proposed Future Research

Questions remain around developing a better understanding how complex multiplayer games might support collaborative learning among peer-players of location-based AR games, particularly within complex domains such as ecology or economics. Additional research can also help us better understand what conditions (what types of in-editor script blocks or related support materials) might be helpful in supporting adult or youth game creators in the design and programming of complex multiplayer games.

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