Accessible Camelot: User Testing with the Excalibur Demo

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Abstract

We designed a prototype mobile app that allows blind game players to efficiently play the hobby board game Shadows Over Camelot, a collaborative game with a traitor component. Our prototype, Accessible Camelot, is designed to be used on a mobile phone with a screen reader and earbuds. Players take pictures of the game board and get information about the Excalibur quest using computer vision. This enables them to check game-state information without tipping off other players as to their secret motives or potential traitor identity. In our second round of user tests, we focused on testing the computer vision capabilities, asking people to take photos at different zoom levels and angles. Testers were able to get accurate information about Excalibur's position and self-correct their photo-taking based on error messages.

Author Keywords

Board games; computer vision; collaborative gaming

Prototype Description

Motivation

Our prototype is a tool designed to be used with the board game Shadows Over Camelot, a collaborative game in which players work together to overcome challenges put forth by the game's mechanics. However, there is a possibility that one of the players is

a traitor whose goal is to undermine the other players so that they lose the game (in this scenario the traitor is the sole winner). This creates a tension between wanting to share information in order to properly work together (and potentially hide one's true allegiance) and keeping information a secret, so as not to tip off the traitor or tip off other players of your true identity as the traitor. With more traditional collaborative games, blind players typically rely on communication with sighted players to keep tabs on the game state; that strategy is problematic with collaborative games with a traitor element.

Figure 1: This is what Shadows of Camelot looks like when it is fully set up.

Design

Our final goal for our design is an application that will allow a visually impaired user to selectively check the state of different parts of the game without tipping off the other players as to what exactly they are trying to check. We feel this is appropriately designed for the game because players constantly check different parts of the game as a part of normal gameplay, but if anyone knew what exactly you were checking they could reasonably guess at the cards in your hand, your future strategy, or if you are the traitor or not.

Our solution is an interface that allows users to select the part of the game they want to check, and then take a picture of the game board. Here's how it works:

- The app is designed to be used on a mobile phone with a screen reader app such as VoiceOver.
- Users take a picture on their phone and upload it to a server which runs a computer vision algorithm.
- The computer vision algorithm works because we modified the game board to include black and white fiduciary markers (unique pixel-like patterns that are matched to a numeric code) on each of the potential Excalibur position locations.
- The server returns the location of Excalibur, which can be at positions -4 through 4, which is then fed back into the mobile app.
- If the location of Excalibur is ambiguous (i.e. the sword occludes more than on marker), the app returns the 2 or 3 possible positions.
- If the photo doesn't include the Excalibur region of the game, or is too blurry to be resolved, the app returns a message asking the user to retake the photo.

Figure 2: The Excalibur quest modified with fiduciary markers, which were printed on paper and then taped to the game board.

User Tests

Test Protocol

We tested our final prototype with two users, both sighted. Neither tester had played Shadows Over Camelot. Before the test began, we explained to the users the key features of the game: (1) it's collaborative with a potential traitor, so players could be working to undermine the group's goals; (2) it consists of a series of distinct "quests" which are represented in different regions of the game board. In our test, we set up the Excalibur region of the game and had a few other game components strewn about for realism. We asked user testers to:

- Go through the app, without VoiceOver (because neither of our testers were experienced with a screen reader), on an iPhone 6.
- Take several different photos (close up, wide shot, with Excalibur in view, with Excalibur not in view) and get real-time feedback about the position of Excalibur.

We observed what they did during the tasks and then briefly talked afterwards about the experience and their recommendations/feedback for improving the prototype. Both members of the team were present for the tests; Wirfs-Brock moderated, and Peters took notes. This test format was quick and easy to do but lacked realism because we weren't playing a true game of Shadows Over Camelot (which takes one to two hours).

Key Observations and Feedback

Here is a summary of what we learned through the user tests.

User Tester 1:

- Had some questions about what buttons to press to take and upload image, but was able to accomplish the tasks when we explained the UI.
- Noticed that when restarting the app by pressing the results button on mobile, it switched back to desktop version instead (which we then fixed).
- UI is clunky when switching back and forth; the photo-taking interaction isn't as seamless as it could be.
- Besides that, commented that it's fairly self-explanatory.
- Didn't know what the "Excalibur position is at X number" means, but noted that if she were a regular game player, would probably understand what that mean. For beginners, we need to make sure we have adequate background information.
- The lag/wait time between uploading a picture and getting feedback about the game state

didn't matter to them, because "if I were a regular user of the app, I would know that there was a wait time, so it wouldn't matter to me."
- The app can produce too many possibilities for where Excalibur can be, i.e. would give results like "Excalibur might be at position -2, -3, -4 or 0" (which we then fixed).
- Overall thought the app was a good idea.

User Tester 2:

- Had several questions about how a blind user would be able to navigate, and how to know how to take the photo of the game board.
- Suggested to use markers on corners of the entire game/game table to guide users to take a centered photo.
- Overall was more skeptical of the idea.

Lessons learned and future improvements

Overall, our testers were able to use our demo with little guidance. At first, both of them assumed that they needed to take a close-up picture of the Excalibur region, and were surprised and intrigued that they could get accurate results with pictures where Excalibur only took up a small portion of the frame. The testers affirmed that this feature is particularly important.

Our demo version was integrated so that a user can take a picture on a phone and then send it to a computer vision script running on a local server (not on the phone). This allowed us to do mobile testing, which examines the picture-taking interaction, which is very important. However, it introduced some UI challenges that weren't present in our "Wizard of Oz" prototype. For example, using the PHP to upload feature required to have a user first select a photo (the phone gives them the option of taking a picture) and then hitting upload. This multi-step process is clunky and not ideal. If we had more time, we would have liked to implement a more seamless interface for taking and uploading a photo (where a user clicks once to take a photo, and then immediately gets the results). Our testers agreed that this was clunky, but said it didn't prevent them from using the tool and understanding its potential.

In our current version of the demo, players are only able to check the status of the Excalibur quest. However, now that we have developed this proof-of-concept version, it would be fairly trivial to extend it to other elements of the game or other board games entirely.