

On Creating a Native Real-Time-Strategy Game User Interface for Multi-Touch Devices

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ABSTRACT

Historically, real-time strategy video games, such as *Starcraft* (1999) and *Command and Conquer* (1995), were intended to be played on desktop or laptop computers, with interfaces that afford the user dozens of keys and key combinations, mouse gestures including clicking and dragging, and several mouse buttons to further complicate the interface while allowing customization and a wide range of possibilities to the user. On a mobile multi-touch platform, there are constraints of limited visual real estate, which is actually shared with the touch command interface. Though work has been done to port real-time strategy games to the mobile platform, to date, there has not been a significant effort to enhance the usability of these interfaces by removing redundancies and tailoring the game commands to these multi-touch devices.

The touch interface presents unique challenges as there are touches and gestures rather than buttons and key combinations. In this paper, we present a rapidly-prototyped user-centered design in a ten-week project of a real-time strategy user interface native for the iPad. As the user's experience is key in creating a robust and intuitive interface, we incorporate the user's feedback in several stages of the design and prototyping of the project. We show changes to the design of the user interface over several iterations and, finally, show a prototype of the user interface system using a game of our own design as a test platform. The contributions of this project are the interface designed for a new mode of interaction (i.e., the iPad platform), the bubble menu, and the ability to cancel orders.

Categories and Subject Descriptors

K.8.0 [General]: [Games]

General Terms

Games

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Keywords

HCI, interaction, video games, touch-screen, iPad

1. INTRODUCTION

On many mobile platforms, multiple compelling games and applications have sprung to life, but the user interface design still has not taken full advantage of the touch surface. In this project, redesign the real-time strategy (RTS) game menu interface to use several intuitive gestures to run natively on the Apple iPad. We theorize that the multi-touch surface of the iPad allows users to play RTS games more quickly and more accurately because gestures use more area and require less targeting precision than traditional buttons.

Current iPad RTS user interfaces are direct translations from their desktop counterparts, and do not take into account the unique requirements of the multi-touch user environment. Existing interfaces present the user with small buttons, or exhibit major design flaws such as the inability to cancel a selected function. This project's design draws on the experience of users who use play RTS games on iPad, and incorporates these users' comments into the design and implementation of the interface. The goal of this project is to implement a new and innovative touch-based interface to give the users a new way to experience RTS game play.

The benefits of using a multi-touch device over a desktop computer include portability, ergonomics, and embracing new technology.

2. RELATED WORK

Currently, there are a few strategy games for the iPad. We found and investigated two games in this genre: *Command and Conquer: Red Alert* (2010) and *Land Air Sea Warfare* (2010). Their pros and cons are summarized in Table 1.

These games informed our design principles, enumerated below.

1. Simplicity of the single touch is powerful and should be prioritized in the design of our system.
2. Affording the user more than two touch points is sometimes confusing; limit the number of touch points to two.
3. Use large, easy to touch buttons.
4. Include a trash can to cancel orders.

We carried these principles into the design and implementation of the iPad real-time strategy (RTS) game prototype.



Figure 1: Storyboard of the system. (1) The user turns on iPad and (2) loads the sample game. The user (3) opens the main menu, (4) selects units, and on (5) the units submenu, (6) drags the unit to the desired location. The user (7) applies a function to a unit. Next, the user (8) invokes the main menu, selects buildings, and on the (9) buildings sub-menu selects the barracks. Next, the user (10) drags the barracks to the desired location, and (11) gives it a function.

	<i>Command and Conquer: Red Alert</i>	<i>Land Air Sea Warfare</i>
Excellent features	a) Building placement: the player taps the building and drags it around the screen to find a location; b) Inclusion of control groups within the user interface	a) Selecting units: Two fingers draw a box; b) Multiple building placement: Hold one finger and drag the other
Needs improvement	a) Three buttons devoted specifically to selecting units; b) Unit and building creation menu occupies too much screen real estate	a) All buttons are tiny; b) Inability to cancel build operation

Table 1: The positive and negative contributions in competitor games informed the design decisions for the prototype game.

3. EARLY PROTOTYPING

The iOS human interface usability guidelines proposed by Apple were our starting points in designing the system. In particular, our goal was to embrace the platform by making full use of the touch-screen interface, a detail ignored (in favor of ease of portability) by currently-available real-time strategy games.

The user’s work flow when interacting with the system on the iPad can be summarized with the storyboard shown in Figure 1.

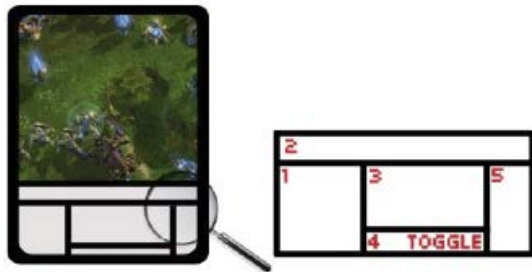


Figure 2: Layout of the screen

Figure 2 shows the layout of the game screen. The features of this interface are as follows.

1. Minimap (can be TAPPED to see different areas of the map quickly).
2. Control Group Buttons (can be TAPPED to select a

Control Group).

3. Unit Name and Statistics (visual aid of selected unit’s or building’s features).
4. Control Group Add/Set Buttons (this is a toggle-able function that allows the user to add units to a Control Group and set units as a Control Group. By default, it is toggled to *add*).
5. Resources and Supply Cap (visual aid of the user’s current resources and supplies).

The low-fidelity prototype shown in Figure 3 was created with paper cut-outs for the various parts of the menu, an iPad screen-sized print-out, and various colored shapes for the representation of buildings and units. The menu system was designed based on interviews with seven users, most of whom were intermediate to expert RTS game players. We tested the prototype with five users. To interact with the prototype, the user would act as if it was a real touch interface, and use all gestures available on the iPad platform. Then, a group member would be responsible for updating the state of the prototype as the user progressed.

At first, it was awkward for the users to interact with the prototype as if it was a real iPad, but after a few minutes the users seemed immersed in the experience. User testing revealed interesting ways of interacting with the control group feature. We found one usability issue: one user was at first puzzled at the number of buttons representing control groups and the screen area for unit information. Eventually, the user found the controls groups fairly manageable and gave some suggestions on unit info panel. Unfortunately,

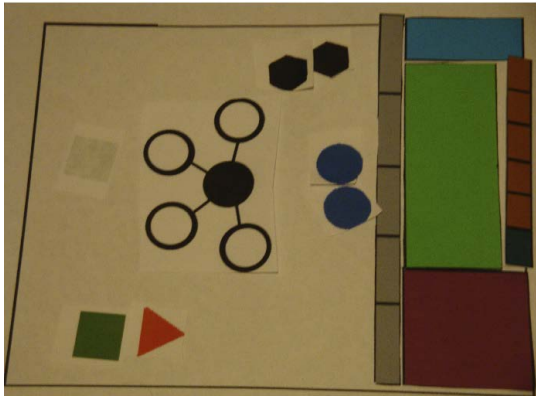


Figure 3: Low-fidelity paper prototype

our feeling was that the low-fidelity prototype failed to show users the potential that this project has, and the user’s puzzlement may lead to a learning curve in the finished product.

4. HIGH-FIDELITY PROTOTYPING

The high-fidelity prototype was created in iOS developer suite for the iPad. A screen capture is shown in Figure 4. The sample game uses geometric shapes in the place of sprites to indicate buildings and units. The red triangle indicates an offensive unit; the blue circle is a worker; the grey pentagon is a supply building; and the yellow square is a barracks.

Most features from the low-fidelity prototype were incorporated in the high-fidelity prototype, including the overlay, control group functions, mini-map, unit information, and resources menu. These components remain in the same places in which they were originally designed. The buildings and units were also incorporated with almost no changes.

Cognitive walkthrough revealed several usability errors. Though the mini-map was displaying the buildings and units, the affordances for the mini-map were not functioning properly. The control group functions were still confusing: one reviewer suggested that a walkthrough of the control groups, different functions, and gestures might be helpful to beginners.

5. CONCLUSION

The iPad interface allows the possibility of many simultaneous touch points – multi-touch. In creating the iPad RTS prototype, we carefully considered the number of touch points to afford the player, and chose a maximum of two for reasons of *simplicity* and *speed*. Our design decisions were informed by commercially-available real-time-strategy games for the iPad.

Two important aspects of real-time strategy (RTS) games are build order and fast access to functions. These are key to winning a game at competitive levels. With these notions in mind, we prioritized touch access when mapping gestures to in-game affordances, with the thought that most affordances should be available with touch. Every element of the prototype game, such as the size and placement of buttons, was designed for touch access first.

Similar games, such as *Command and Conquer* for the iPad, require the player to use many fingers simultaneously

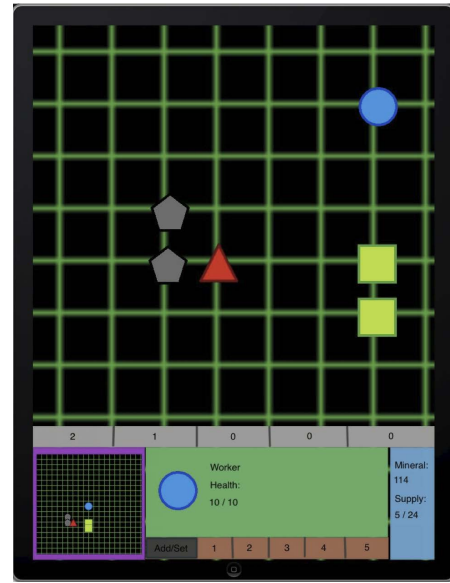


Figure 4: High-fidelity prototype of the user interface and sample game. The blue circle (selected) shows a worker at full health.

(such as selecting a group of units by placing a triangle with three fingers) – both inefficient and unintuitive, as we saw in our preliminary tests. We wished to keep the learning curve shallow; that is, we wanted players to be able to play the game easily and intuitively without needing to learn complicated gestures.

Finally, for the purposes of speed of play, we noted that the press-and-hold gesture should be avoided, as the hold duration disrupts the pace and rhythm of the game.

6. FUTURE WORK

The user interface will be tested with at least ten participants, all of whom have had extensive experience with real-time strategy games. We wish to stress the importance of our novel user interface rather than the underlying game mechanic; hence, the users must be domain experts. The system will be compared against the iPad version of *Command and Conquer*. A within-subjects design will ensure that participants have an equal grounds for comparison with a known system. The order in which participants see and play the games will be randomized to reduce participant bias. Qualitative and quantitative approaches will be used to glean the most information about the system given the small number of pilot participants.

In the proposed study, we will analyze the amount of time it takes users to issue commands as well as the number of mistakes a user makes in a game session. These measurements will quantify the claims of speed and accuracy. Additional studies could be performed to determine the differences between playing RTS games on a PC versus a touch-screen device such as an iPad, comparing speed, accuracy, and user preference between the two devices. By having a within-subjects study, we will receive feedback from participants who have played both PC and iPad versions of the games to determine which user interface features are essential for successful play of RTS games.