Toward Game Orchestration: Tangible Manipulation of In-Game Experiences

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ABSTRACT
We define *game orchestration* as the activity of creating experiences for game players at run-time. This paper presents a design space for game orchestration techniques, and describes two novel game orchestration systems.

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Game orchestration, tabletop interfaces

ACM Classification Keywords
H5.2. User Interfaces.

General Terms
Design, Human Factors.

INTRODUCTION

Digital games represent an asynchronous dialogue between the game's designer and its players. This dialogue is constrained by the rules and settings the designer has programmed into the game. For example, the Grand Theft Auto series of games is praised for its open-ended "sandbox" gameplay, but if a player wishes to run for mayor or open a grocery store, he cannot, because no program code has been provided to support these actions.

An emerging approach, which we term *game orchestration,* allows game design to continue into the actual play of the game. An *orchestrator* manipulates gameplay in real time, in response to player's actions. The orchestrator's role is to create and manipulate game experiences, opening far broader possibilities than with traditional game design. Game orchestration draws inspiration from pen and paper role playing games where a game master guides players through an interactive adventure.

Game orchestration relies on rapid and rich interaction with the game world. We argue the benefits of tangible interaction techniques based on multitouch interaction with surface computers. Specifically, we present a design space of orchestration techniques, and report on two novel game orchestration systems based on tangible interfaces.

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EARLIER EXAMPLES OF GAME ORCHESTRATION

To motivate the different ways in which game orchestration can be facilitated, we briefly consider some examples of existing approaches.

Game Master: Bioware's Neverwinter Nights game attempts to replicate the experience of pen and paper role playing games in digital form. A game master has a special version of the game client allowing rapid navigation and modification of the game world, affording real-time creation of experiences for players. In Jason Rohrer's *Sleep is Death,* a game master guides collaborative story telling.

Commander Role: In Unknown Worlds' Natural Selection game, players can take on a "Commander" role. Most players see the world in first person view as a soldier on the ground. Commanders view a top-down strategic display, showing the location of individual players. The Commander guides the players' experience by giving them movement and fighting directions which they must in turn carry out.

Game Sketching: Sketching allows early evaluation of game designs [1]. Designers use Wizard of Oz techniques to act out game ideas in real-time, responding to players' actions. For example, with Raptor, designers use a tabletop display to modify the game world in real-time [4].

Some existing digital games recognize the importance of game orchestration, but replace the role of orchestrator with artificial intelligence [2,3]. This ultimately maintains the scripted experience of traditional digital games.

DIMENSIONS OF GAME ORCHESTRATION

The following dimensions capture some of the design alternatives of game orchestration systems:

Orchestrator's Goal: The orchestrator can *share the player's goals* (as in Natural Selection); can be an *opponent*, or can have the goal of *creating an enjoyable experience* for players (as with Neverwinter Nights and Raptor).

Interface: The orchestrator's interface may offer a *different perspective* than that of the players; e.g., Natural Selection and Raptor offer a top-down strategic view versus players'

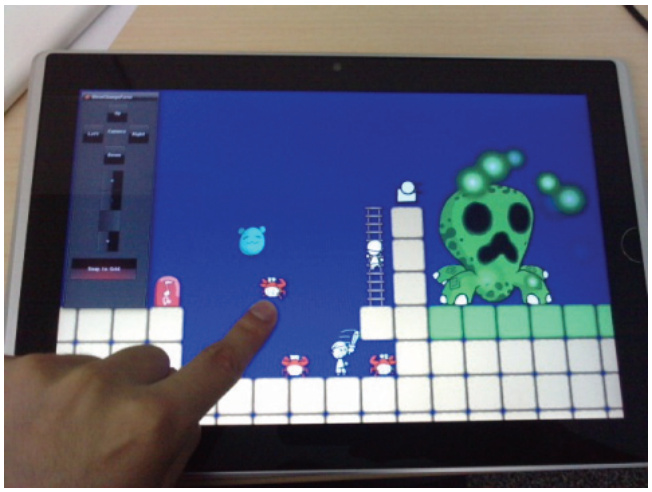

Figure 1. Liberi Live allows creation of content in real-time in a multi-player exergame

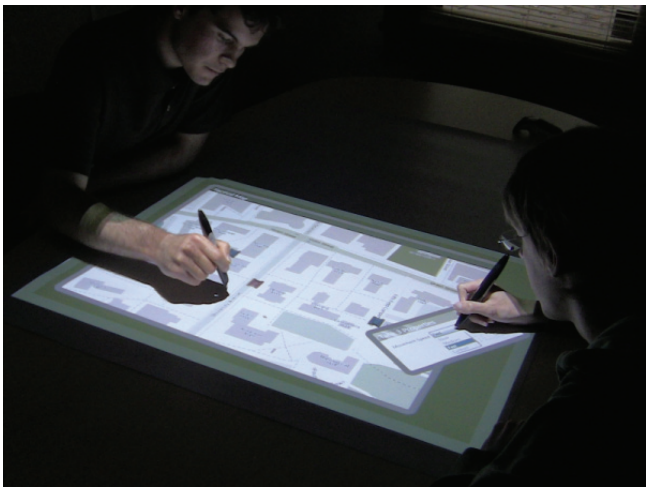

Figure 2. The OrMiS tool allows behind-the-scenes orchestration of military simulations

first-person view. Alternatively, the interface may provide an enhanced version of the standard client, as in Neverwinter Nights.

Interaction style: Orchestrators may use a *tangible interface* (as with Raptor's tabletop interface), a traditional direct manipulation *graphical user interface* (as with Neverwinter Nights), or a programmatic interface (as with live events in some massively multiplayer online games.)

TWO EXAMPLES OF GAME ORCHESTRATION

Liberi Live: Liberi is a multi-player exercise video game designed for children with Cerebral Palsy. The game allows players to traverse and interact with a virtual world using a cycling ergometer. *Liberi Live* is a game orchestration client for Liberi, allowing high-intensity real-time creation of game content (figure 1). Orchestrators can create new terrain, add new entities to the game, and animate existing entities, all while people play the game.

Because of the need to create and animate content without slowing players down, Liberi Live must trade off expressiveness for speed of operation. An orchestrator uses a paint-like interface to draw terrain and entities into the world, selecting from a palette using a radial menu. On a larger table, small groups of orchestrators can combine efforts to create content more rapidly. The tangible interaction with the world (literally like finger painting) is critical to rapid creation and manipulation of content.

According to our design space, Liberi Live orchestrators have the goal of creating an enjoyable experience for players, using a same-perspective, tangible interface.

OrMiS (ORchestration of MIlitary Simulations) supports the execution of simulation-based military training exercises (figure 2). The simulations train military officers being sent into command positions. From their command bunker, the officers communicate with the outside world using radio, text chat and telephone, and can see drone feeds showing the live battlefield. In the simulation, the person at the other end of the radio/chat/phone is an "interactor", pretending, for example, to be an officer in the field. The interactors enact the trainees' orders using OrMiS, a tabletop environment showing the battlefield and the units on it. The trainees do not see OrMiS; it is used behind the scenes as an interface to the simulation environment.

Unlike Liberi Live, the pace of orchestration is slow and deliberate. When a unit is given a command (e.g., move to a new location), that command may take minutes to execute. Simulations themselves can last for several days, with different shifts of trainees coming on and off duty.

In terms of our design space, OrMiS users aim to give a compelling and accurate experience to the trainees; they use a different-perspective interface (in fact, the trainees never see the tabletop); and use tangible (touch) interaction.

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