Chapter 14
Interactivity, Process, and Algorithm

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ABSTRACT

The most serious impediment to the progress of serious games is the difficulty of grasping the abstract concept of interactivity. Our brains are prejudiced in favor of thinking in terms of objects rather than processes. A firm grasp of interactivity requires a process-oriented way of thinking that does not come easily.

INTRODUCTION: SOME PERSONAL HISTORY

My first serious game was pathetic. It was an energy environment simulation, giving the player a few basic policy options and calculating results in terms of energy production and environmental consequences. The algorithms were primitive. The user interface was so bad that I had to stand next to the player, explaining what the cryptic display meant. As for graphics—they didn’t exist. There were just a series of numbers and a teeny-tiny bar chart display.

I blame the hardware (a KIM-1 single board computer with support circuitry of my own design). It boasted an eight-bit processor running at 1 MHz with a grand total of 5 KB of RAM. It was mounted inside a heavy mahogany case with a huge transformer for a power supply. There was no keyboard, just a 24-button keypad. There was no video display, just a group of 6 seven-segment LEDs, the kind that you see in old calculators. The program was written in assembly language and was loaded into memory from a tape cassette (see Figure 1).

That was back in 1978. Since then, I have written quite a few serious games; indeed, almost every game I ever wrote was basically what people today
call a serious game. There was certainly nothing frivolous about my games. My war games weren’t about action or violence—they were about the logic of military operations, the sad calculus of blood by which wars are won or lost. My most successful game was an “un-war” game: Balance of Power, a game about geopolitics during the 1980s in which the player lost by triggering a nuclear war (see Figure 2). I have also created games about environmental issues and games about interpersonal conflict.

In these years, I have made a great many mistakes and so have learned a great deal about what works and what doesn’t work in designing serious games. In this chapter, I shall explain three of the fundamental principles that I have learned:

1. **interactivity is the central and fundamental attribute of computing.**
2. **Data and process are two fundamentally different aspects of reality.**
3. **Process is essential to interactivity, and it requires mathematical expression.**

**INTERACTIVITY IS THE SINE QUAE NON OF COMPUTING**

If the entire thrust of my career could be reduced to a bumper sticker, it would read, “It’s the interactivity!” Interactivity—not graphics, not animation, not sound—is the essence of what computers do. People have difficulty realizing this because computers do graphics, animation, and sound so well. A computer is like a screwdriver. You can use a screwdriver to punch holes, to pry things apart, even as a weapon, and it does all these tasks well. But the basic task of a screwdriver is to turn screws, and in an imaginary world with a dearth of screws, people would have difficulty grasping that the essence of screwdrivers lies in the turning of screws. Graphics, animation, and sound are relatively easy to do on a computer; interaction is harder. So people naturally do what comes easily and avoid what is difficult. The problem is compounded by the dearth of good examples of interactivity; without such examples to inspire them, people continue to use the computer for familiar tasks rather than those tasks that take best advantage of the strengths of the computer.

This point is so important, and so poorly appreciated, that I’d like to spend a little space expanding upon it. Rather than concentrate on games, I propose to start at the top and work down. What is the single most common and useful application to which computers are put? I claim that word processing is that application. There are plenty of other applications that grab lots of attention, but word processing has been the single most heavily used application of computers for at least 25 years.

Word processing is now so standard that it’s difficult to remember the days of typewriters. The rapidity with which the computer as word processor replaced the typewriter clearly demonstrates that word processing is much more valuable than typewriting. But what makes it so much more valuable?
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