Woggles from Oz: Writing Interactive Fiction

(Full Version)

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The term "interactive fiction" describes any artifact — book, theater script, image, automaton, or computer program — allowing a reader to make choices that determine the unfolding of a story. An ordinary book or movie is not interactive in this sense: it has a static, linear progression of events. On the other hand, movies with alternate endings to be chosen by the audience and books where each page can be followed by one of several others are long-established — if not yet very highly developed — modes of artistic expression.

Adventure, a textual computer game developed at MIT in the 1970s, is the patriarch of the genre. An Adventure "document" is a simple network of nodes representing places and links connecting them. A link can be traversed by typing its name, and each node carries some descriptive text — anything from half a page to a pithy phrase like "You are in a twisty little maze." Some of the link names represent clear spatial relationships: by typing the command `NORTH`, you follow a link with this name and arrive at a node that the author has decided lies to the north of your present location. Others, like `ENTER BUILDING`, may represent less obvious spatial relationships. Still others have names that cannot be guessed at all from the description that accompanies the node: in the classic Adventure, one node has a link named by the magic word `XYZZY`, which can only be learned in another part of the caverns. A few scenes from a session with this Adventure read:

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You are in a splendid chamber thirty feet high.  The walls are frozen
rivers of orange stone.  An awkward canyon and a good passage exit
from east and west sides of the chamber.

[READER] WEST
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At your feet is a small pit breathing traces of white mist.  An east
passage ends here except for a small crack leading on.

Rough stone steps lead down the pit.

[READER] DOWN

You are at one end of a vast hall stretching forward out of sight to
the west.  There are openings to either side.  Nearby, a wide stone
staircase leads downward.  The hall is filled with wisps of white mist
swaying to and fro almost as if alive.  A cold wind blows up the
staircase.  There is a passage at the top of a dome behind you.

Rough stone steps lead up the dome.

[READER] NORTH

You are in the hall of the mountain king, with passages off in all
directions.

A huge green fierce snake bars the way!
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For the author, these primitive building blocks — nodes decorated with text and connected by named links —place few obvious constraints on the kinds of stories they can be used to tell; but in fact, the constraints are severe. The activities of non-reader characters cannot readily be described in such a static framework; nor are all kinds of scenes amenable to description in terms of nodes and links. (If you are standing in the middle of a large meadow, should walking forward 10 meters leave you in the same "place" or in a different one? Neither answer is satisfactory.) Also, the descriptions of places are frozen: each looks the same at all times of day, in all weather, etc. An even more serious problem is the exponential branching of storylines that can result from the reader's ability to make choices. If a story's first scene offers a choice of two doors, the author faces the task of writing two complete sequels instead of one; in each case, another choice appears soon afterwards and the situation can quickly become unmanageable.

There are two basic solutions. On one hand, the author can give up on the notion of "story" and construct a world in which *any* path through the nodes will provide a satisfying experience for the reader, by virtue of the individual interest of the descriptions and by the patterns of association that arise from moving through them in different ways — a kind of aleatory, expressionist prose-poetry achieving its effects through symbolism, allusion, and piecemeal revelation of images. Some proponents of interactive fiction believe that this style will ultimately hold the most interesting artistic possibilities. Alternatively, the idea of a story can be retained, but the degree of branching somehow restricted so that, although it may appear that the reader is making a series of crucial choices, the resulting stories continually flow back together so that the author need only think about three or four plot streams at a time. Most commonly, the two solutions are combined by embedding manageable knots of narrative complexity — single scenes, conversations, or puzzles to be solved — in a relatively simple global structure.

The "moving parts" of a story pose other problems. Most variants of Adventure include a few kinds of objects — torches, treasure, magic wands, songbirds, and the like — that can be picked up and used to solve puzzles later in the game, as well as some simple characters with set roles to play, like the huge green snake and a dwarf that steals your treasure. More complex props and characters were developed in a series of games written at a company called InfoCom. Rather than offering a large, unstructured world containing many individual puzzles, each InfoCom game is organized around a single plot with clearly identified crises, with characters who engage in certain sorts of interactions with the reader (or in the reader's presence), and with a small collection of possible outcomes. The reader's repertoire of possible interactions with the game remains small: the system's recognizes simple keywords for moving around the world and performing predetermined actions in particular situations. Even so, the games have a dramatic coherence not found in Adventure stories.

More recently, the genre of Multi-User Dungeons (MUDs) has extended the concept of Adventure by supporting several simultaneous readers, each sitting at a terminal connected to a network, and by providing tools for the readers themselves to enlarge the network of nodes and links. Accessible from many college campuses in the U.S. and Europe via the Internet, popular MUDs have grown to occupy dozens of megabytes of storage (the equivalent of thousands of pages of linear text) and experience continuous use and modification twenty-four hours a day by between three to hundreds of people at a time. Perhaps the attraction of interactive fiction as a creative medium needs no stronger justification.

Oz, a new interactive fiction system under construction at Carnegie Mellon University by Joe Bates and his students, vastly extends some of the author's creative options compared to Adventure, while limiting others. Like Adventure, Oz can be used in an expressionist mode where the author simply constructs an interesting world for the reader to explore. But the richer structure of an Oz document actually inhibits this sort of use. In Adventure, the author is free to use all the expressive resources of English to describe a scene. In Oz, it is the system that describes scenes to the reader: the author's job is literally to *build* them — a wall here, a door there, a writing desk, enigmatic words scribbled on an envelope —gluing predefined pieces into larger edifices like electronic lego blocks. This done, the system generates textual descriptions that take into account the reader's focus of attention, rearrangement of props during the story, visibility through open doors but not closed ones, sounds diminishing with distance, etc.

The Oz project intends to take technological risks — to try to go quite a bit beyond the current state of the art in interactive storytelling programs. They envision something much more compelling to both reader and author, something closer to the feel of an avante garde theater piece where the actors engage the audience in semi-improvisatory dialogue. Joe Bates can talk for hours about robot characers with independent emotions, goals, and strategies, automatic plot managers that watch the action unfolding and gently nudge events toward a desired resolution, or conversations in English between human and computer characters.

Of course, setting out to build a system to do all this in 1988 would have been pure fantasy. Decades of effort had been lavished on these problems by researchers in Artificial Intelligence, with very modest results. The strategy of the Oz group is to take the best systems that their colleagues in A.I. have produced so far — the best natural language understanding and synthesis systems, the best models of cognition and emotion, the most sophisticated ways of describing behaviors and plans — and to weave it all together into a working system. None of these systems have achieved anything close to the competence of an average human child, so in every dimension the result will fall short of what they can imagine. But by combining advanced present-day technologies, they hope to achieve a broad — even though shallow — simulacrulum of intelligence, counting on the reader's suspension of disbelief to make up the rest.

The goal of Oz is not to build artificial worlds with structure or texture comparable to the real world. Like a cinematic set, the world where a story takes place need only be a satisfactory simulation. Still, with present-day technology it can be very difficult to build scenery so as to obtain a desired effect. Mark Kantrowitz, one of Joe's senior students, has made progress on techniques for generating coherent descriptions in something more or less resembling English, but it might be too generous to describe the result as stilted. Here is a scene from one version of the Oz group's "Lyotard the cat" demo:

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You are in the bedroom:
To the south, you see the closet door.
To the south, you see the closet.
To the west, you see the sunroom.
To the west, you see the red bedroom door.

Lyotard, the small liquor cabinet, the wicker trash basket, the
bed and the table are located in the bedroom.  The small book and the
red superball are located in the under bed space.  The white brush
and the black china cup are on the table.

Lyotard licks himself.

[READER] PET THE CAT

You pet Lyotard.
Lyotard meows.
You hear a MEOW.
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This is a variation on a familiar theme; simple mechanisms often enjoy an adaptability that is lost when more powerful technology is brought to bear. But, although the loss of linguistic elegance is a shame, this doesn't overly concern the Oz team for the moment, since using Oz solely to build beautiful or evocative artificial worlds is not their primary aim. The worlds themselves are just props, backgrounds against which believable stories can take shape.

Stories in Oz arise primarily from the interaction of a human reader with characters controlled by the computer. Like the props, these characters need not be complete, self-sufficient entities in their own right; it is only important that they appear so to the reader. When the reader isn't looking, characters need not respect the laws of physics or perception. For example, all communication between characters and the reader is carried out in English. (More precisely, the characters speak to the reader in English, using stock phrases provided by the author. Understanding what the reader says is accomplished by a combination of tricks like scanning inputs for particular key words.) But for communication between actors, more expedient solutions are often used. One actor may, as it were, reach directly into the mind of another to set a switch that means "Now it's time to go to the chapel and start the knife scene."

The behavior of Oz actors is described by collections of scripts that come into play in different situations. The actors in a party scene share common scripts for drinking, shmoozing, and flirting, while certain individuals have additional lines to be delivered when the need arises. The reader's arrival in the kitchen triggers an exchange of confidences between two actors who have been waiting there; ringing a doorbell signals the hostess to stop talking and go open the door; a request for directions elicits an appropriate response from the porter.

Scripts can be used to generate complex, convincing behaviors. Like Adventure's web of connected nodes, different scripts are activated at different times so that segments of the story may occur in various orders. But the segments themselves are rigid: if a dialogue between two characters is interrupted by some unexpected action on the reader's part, there is no way to recover — or, if there is one, it must be explicitly and laboriously prearranged by the author. There is no sense in which the actors "intend" to say something to each other: each is simply constructed in such a way that "When she says X, I respond with Y; then she says Z, and I say..."

Much of the recent development of Oz has concentrated on replacing scripts with more refined models capable of describing actors' behavior in terms of "goals" and "strategies." There is still no pretense of building artificial minds that accurately model human thought patterns. Besides being too hard to achieve, this level of detail would miss the point of the exercise, which is precisly to provide practical tools that can be used relatively easily by an author to create the appearance of mental processes in the characters of a story.

Over the years, several demonstration pieces of interactive fiction have been written in Oz. Most of these have been limited experiments, like the cat that the group built to test their ideas for modeling the emotional states of characters. A few, like their copy of the old InfoCom mystery, Deadline, have been more ambitious, offering complete plots, sets, and casts of characters. In 1992, they decided it was time to bring their recent ideas about cognitive models for non-reader characters together with work at CMU on real-time animation. The result was the world of the woggles.

Woggles are imaginary land creatures with expressive eyes and spherical shells of brightly colored putty, living in a Dr. Seuss landscape of boulders, buttes, and canyons on the screen of a state-of-the-art graphics workstation. Lacking a mouth, their means of communication are simple: bobbing up and down to signal greeting, hopping back and forth, sulking, and, when angry or threatened, gathering themselves up into menacing discs. They spend their time sleeping and leaping placidly from rock to rock, sometimes meeting, exchanging greetings, and dashing off for a game of follow-the-leader. The big blue one keeps an eye on the smaller yellow one, whom the red one tends to bully: you sometimes see them clustered in a group, the yellow one huddled in a corner trembling, the red one glowering, and the blue trying to get between them. Besides these three, there is a purple woggle that spends most of its time asleep. When awake, it is controlled by a human reader sitting at the workstation: pointing with the mouse makes the woggle hop to the indicated place on the screen; pressing buttons produces greeting or threatening motions that the others can see and respond to.

In a strict sense, this is not interactive fiction: we are free to impose a narrative reading on the events unfolding on the screen, but this is entirely a matter of interpretation after the fact; there is no story designed into the system itself. ("We ran out of time for a number of things," says Bryan Loyall, one of the system's architects. He and a dozen colleagues had to do a lot of programming to integrate the various pieces and make the resulting system run in real time.) Even so, the immediacy of a graphical presentation evokes the creative possibilities of the new medium much more powerfully than its text-based predecessors.

Besides demonstration pieces, the Oz project has produced solid scientific results, including Mark Kantrowitz's work on automatic generation of realistic English and Bryan Loyall's modelling of characters with emotions. Moreover, as pure entertainment this is clearly a technology of the future; it is no accident that Oz has received substantial funding from Japanese game manufacturers. But what, artistically speaking, does it come to? Is the simple sequence of events really such an important element in the stories we enjoy hearing and telling? Reading a Shakespeare play or a yarn by Mark Twain, we respond to the narrator's wit, verbal music, and skill in showing characters from revealing angles. These qualities may also be present in a work of interactive fiction, but they do not depend on its interactivity for their effect. Of course, there are literary forms where interactivity in the literal sense might enrich the reader's experience. Authors of mystery stories go to great lengths to let readers second-guess the super sleuth. Why not just let the reader *be* the detective? In an escapist fantasy, why make the reader a silent partner? Where a moral dilemma is involved, can the experience be more direct if the reader must actually make choices and observe their consequences? (Indeed, interactive fiction might better be thought of not as literature but as a kind of theater.) But even in these forms, the difficulty of writing interactive fiction may seriously limit its uses.

A system like Oz is an experiment in illusion. The linguist William Croft once remarked that the famous computer psychoanalyst, Eliza, which succeeded in fooling a surprising number of people by using a tiny set of stock responses ("Tell me more about your mother..."), was a revelation less of its audience's gullibility than of an astonishing regularity in a certain kind of discourse — a regularity that its author, Joseph Weizenbaum, succeeded in isolating and exploiting. In this respect, the earliest versions of Eliza are probably the most successful: as more mechanisms are added to make the program "understand" a broader range of inputs, its actual lack of understanding becomes more and more apparent.

Moving from conventional, linear text to Adventure's web of nodes and links, the author confronts an explosion of plot possibilities. In systems like Oz, where the "document" is a tiny artificial world, this explosion is mirrored by a proliferation of complex interactions among its constituents. The author's attention is increasingly distracted from literary or dramatic effects to the intricacies of constructing props, sets, and scripts that will interact properly to produce these effects. Ultimately, the tasks of writing and programming — each of which is more than difficult enough in itself — begin to blur. To avoid overwhelming the author, designers of interactive fiction systems must find smooth regions in a vast space of possible designs: technologies for building worlds and characters, for scene description, for interaction that achieve precisely the right level of sophistication and that, together, can create seamless effects.