ifMap: A Mapping System for Cooperatively Playing Interactive Fiction Online

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Abstract. Adventure games, and specifically the textual kind that are works of interactive fiction, are actually cooperative games. How people cooperate to solve them is not well understood, however. We describe *ifMap*, a system to allow interactors trying to solve a work of interactive fiction together online to create a shared map. The system is based on cooperative hypermedia and combines different hypertext domains. Developing this system has already led to some insights about how to best represent knowledge of an interactive fiction work's simulated world; it should also enable better study of cooperation among interactors in the future.

1 Interactive Fiction as a Cooperative Experience

Interactive fiction is a new media form; works in the form generate narratives during an interactive session. These works include what are commonly known as "text adventures," although certain works of interactive fiction, even ones that involve puzzles and are structured like a game, with a best possible outcome, are not "adventures" in the typical sense. Interactive fiction works are almost always games, but they are essentially potential narratives: systems that can describe the events that transpire in a simulated world. The interactor can type input in natural language to influence what goes on in this world. The narratives that result will be different depending upon what this input is. "Solving" such a work is most strongly interpreted, by analogy to the literary riddle, as requiring a complete understanding of the essential workings of an interactive fiction's simulated world [4]. This can involve more than simply producing a *successful traversal*, a narrative that ends with a "winning" text. We are concerned here with the actual process of solving interactive fiction in the stronger sense.

In a game-theoretic approach, Eric Solomon explained that in adventure games, "[i]f there are many players, as is often the case, they function as a team." [9] From casual observation of people playing adventure games, of which Will Crowther and Don Woods's *Adventure* is the archetype, it is clear that cooperation of various sorts is frequent, if not the norm. Indeed, Solomon describes the lone player trying to solve puzzles and understand the workings of an adventure game as a degenerate case in a fundamentally cooperative situation.

In this paper we will focus on adventure games that are textual and are of the particular form called interactive fiction. Although it is appropriate to say that people "play" such interactive fiction—they do—we call these players *interactors* to highlight that playing is only one aspect of the activity (along with reading and writing, for instance) that is being done by these users. Interactors may work together in several ways. A lone interactor may consult a walkthrough or hint file written by another, or a more experienced interactor may look over the shoulder of someone sitting at the computer, offering hints; this type of situation is described by Tracy Kidder in *The Soul of a New Machine* [2]. Two or more interactors may work together, either sitting in front of the same computer or by cooperating online when they are not physically co-located. In this paper we are concerned with this last case of online cooperation, specifically when it is accomplished by running an interactive fiction work through a bot in a MUD (a Multiple User Dungeon, named for the interactive fiction work *Zork*, which was briefly known as *Dungeon*). There are other ways to cooperate online. If no such bot is available, the interactors can each start independent sessions and discuss their progress via a synchronous, textual chat channel: IRC (Internet Relay Chat), a MUD, a chat room, or IM (Instant Messaging). Interactors could also use the telephone or email, at the cost of not being able to copy-and-paste in the former case and of not having synchronous communication in the latter. But there are advantages seen when both interactors participate in a single session, so this is the case we consider.

We next analyze the mapping activity in order to identify important requirements for ifMap. Section 3 describes the system in more detail. Then, we compare our system to related work. The paper ends with our conclusions and plans for future work.

2 Mapping and Its Requirements

Whether working alone or with others, it is common for interactors to make maps of the interactive fiction's simulated world, called the *IF world*, as they explore it. Kidder [2] described such a map for *Adventure*:

> Carl Asling's cluttered little area made a small rectangle of light. Strewn before me across the surface of his desk, like relics from a party, lay dozens of roughly drawn maps. They consisted of circles, inside of which were scrawled names such as Dirty Passage, Hall of Mists, Hall of the Mountain King ... Webs of lines connected the circles, and each line was labeled, some with points of the compass, some with the words *up* and *down*. Here and there on the maps were notations—"water here," "oil here," and "damn that pirate!"

Example maps were even included with many commercial works of interactive fiction, including all of Infocom's publications. Creating such maps helps interactors in several important ways, largely because (a) such a map is a representation of the IF world, and (b) the generated narratives of an interactive fiction session are not just situated in the IF world; they are directly generated from it. In other words, the map represents a very important element of the interactive fiction and helps interactors reason about how to solve the interactive fiction work. Fig. 1 shows a map created by one interactor on a piece of paper while playing Jacob Weinstein and Karine Schaefer's *Save Princeton* cooperatively on ifMUD (http://ifmud.port4000.com:4000).

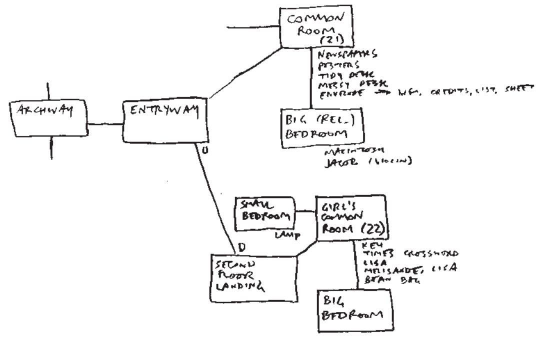

Fig. 1. A map created by an interactor on a piece of paper while playing *Save Princeton*

The interactor used rectangles to represent locations and lines between them to represent connections. In addition, he added text to give names to locations and to those objects he considered important for solving the interactive fiction, those he wanted to remember and perhaps discuss.

As can also be glimpsed in Kidder's description of Carl Asling's map, a map usually abstracts away a great deal of information, often only indicating what the names of the different locations are, how they are connected, and what objects they contain. Such a representation can be, for a single interactor, a useful way of recording knowledge about the IF world and of reasoning about the IF world.

Two or more interactors sharing such a map can use it to abbreviate their communications with one another and to reason about the IF world together. The process of jointly creating the map can itself lead to a better understanding of the IF world. For instance, one interactor might note what sort of objects another interactor tends to consider important and worthy of adding to the map—objects some might consider mere "scenery"—and a discussion about this could lead to new insights about the nature of this world and what elements in it play an important role in the game and in its possible narratives. While there are other ways to represent the IF world (some interactors use a connectivity matrix; many other representations can be envisioned) many interactors already effectively draw maps of this sort. Such mapping could aid in cooperation even when interactors do not wish to learn a new representation technique. A system for sharing maps of this sort needs to support:

R1. the definition of IF-world related knowledge (the map);
R2. cooperative access to and manipulation of the map;
R3. a visual interface for manipulation and visualization of the map following the paper-based way of mapping;
R4. annotating elements of the world; and,
R5. awareness about the actions of other interactors.

3 The ifMap System

The ifMap system, built to address these requirements, is based on cooperative hypermedia and combines different hypertext domains. Hypermedia-based structures are well-suited to represent knowledge using typed links and typed nodes [5]. For this reason we have used a hypermedia-based structure to address R1. Nodes are connected by links, and composites can contain other hypermedia objects and thus allow nested structures. Every hypermedia object is also a shared object with a unique identifier, shared attributes and the possibility to make it persistent. Fig. 1 shows a simplified extract from the shared hypermedia data model. Concurrency control and change propagation mechanisms are applied on shared hypermedia objects. This supports users in accessing shared and persistent hypermedia objects, which is needed to address R2. Fig. 2 makes use of UML-G [7] in order to model independently from any concrete architecture. The *observable* tag expresses that notifications about changes on instances of *HMObject* need to be supported in order to support synchronous cooperation and awareness (see R5). Actions performed by others (manipulations on hypermedia objects) are broadcast to all sites in order to support awareness and always present a consistent shared map. The shared hypermedia objects are modeled as persistent since interactors might continue joint mapping later.

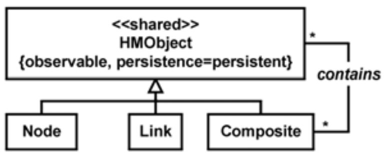

Fig. 2. Shared hypermedia data model

We use *semantic types* in order to support the “language” of the end users (the interactors). Basically, a semantic type includes a name and an icon. It captures application domain concepts and relationships and constraints can be defined on it. For instance, a room (a location) is modeled as a hypermedia composite since it can contain objects. In addition, the semantic type “room” is applied and visualized. In addition to the shared hypermedia data model, which is essential in the context of cooperative hypermedia, we employ a graph-based visualization that shows the structure explicitly in order to address R3. Composite objects, such as rooms, can be opened within the same view so that the whole hierarchy can be visualized in one map. Visual artifacts can be used for annotation and explanation, and the relationships between parts of the world (such as objects and the room they relate to) can be indicated by the spatial proximity of elements of the map (see R4); spatial proximity and visual artifacts are essential ideas in spatial hypertext [3]. By not enforcing certain types of formal structure, interactors can express uncertainly, can create and annotate incomplete maps, and can explain parts of the map and suggest future courses of action.

The current prototype is implemented as a configuration of XCHIPS4KM [8]—a cooperative meta-modeling environment for knowledge management. This environment provides several tools to configure a cooperative hypermedia system. The tools are based on DyCE [10]. DyCE is a Java-based framework that supports the development of groupware components manipulating shared data.

Fig. 3 shows two interactors using the prototype while playing Nick Montfort's *Winchester's Nightmare*. The users' names appear in the top left. They modeled several rooms, connections, and annotations. The action "listen to shell" was found to lead to "Armory Gate." A telecursor with a nickname (such as "nm") allows all the interactors to see who is currently touching a node.

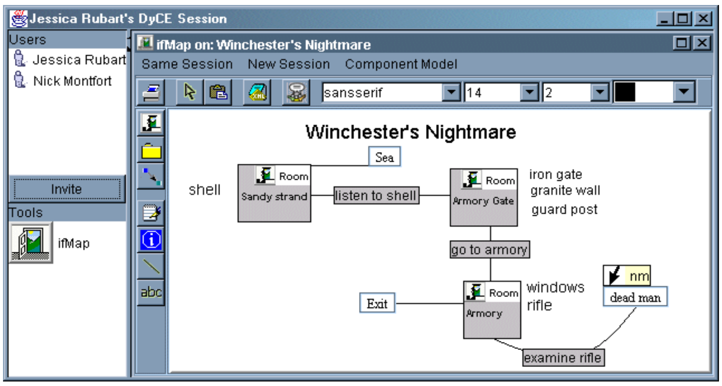

Fig. 3. Two interactors using the ifMap system when playing *Winchester's Nightmare*

4 Comparison to Related Work

The ifMap system complements some systems mentioned earlier, such as MUDs. Other groupware systems supporting the metaphor of a shared space, such as shared whiteboards or brainstorming systems, are not specifically designed to support cooperative mapping while playing interactive fiction. Knowledge-centered systems usually focus on specific tasks, such as support for searching, document management, data mining, or cooperation, as seen in Tempus Fugit [1] and FOCI [6]. However, our specific requirements for supporting a group of interactors working to solve interactive fiction are not addressed by these systems. Finally, there are numerous systems to allow individual users to create IF maps, several of which are available from the IF Archive (http://www.ifarchive.org /indexes/if-archiveXmapping-tools.html), but none of these allow multiple users to update the same map while cooperating online.

5 Conclusions and Future Work

In this paper we explained *ifMap,* a system to allow interactors trying to solve a work of interactive fiction together online to create a shared map. By analyzing the way interactors work together and use maps, we identified several requirements for a cooperative mapping system. Then, we presented the technological concepts of ifMap. Early experiences with our prototype suggest that the system does help interactors gain a better understanding of the IF world. They also allowed us to identify additional requirements, such as supporting a mixture of automatically arranging connections that were optimized for available space and laid out geographically to express the usual cardinal directions. In our future work, we will improve the system and will involve a larger user community to evaluate ifMap and to learn more about how interactors cooperate.

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