An Analysis of Location Models for MOOsburg

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Abstract. Based on an analysis of our online virtual community, MOOsburg, we identify two challenging requirements for location models. The need to support parallel physical and virtual worlds and the need to allow for complex definitions of proximity are explored. Two scenarios involving these requirements are presented as well as a discussion of the inherent issues.

1 Introduction

Applications use a location model to provide access to information about people, objects and data. We are interested in the use of location information to support collaboration. Virtual worlds are a popular way for people to communicate. They are online environments such as groupware tools, collaborative websites MUDs and MOOs. Analyzing our virtual community software uncovers two interesting requirements for creating general location models.

First, location models need to support an integration of physical and virtual worlds. As ubiquitous computing devices become easier to network, it becomes practical to integrate those "devices" into virtual network communities. For example, electronic whiteboards and other input devices can exist in parallel virtual and physical spaces. Similarly, information present in a virtual world can be made available in the physical world. For example, peripheral displays in the real world can show activity in a parallel virtual space.

Second, location models need to support complex notions of proximity. Simple definitions of proximity only take physical distance into account. Yet, physical proximity is not the only way to determine the information available. For example, another approach is to use the context of the user’s activity to define proximity. Additionally, items such as geographical features (roads, streams, etc.) and properties can have their influence. Currently, we are analyzing location models that could support these requirements for our online network community MOOsburg.

2 Background

MOOsburg is a place-based collaborative virtual community designed to closely parallel the town of Blacksburg, Virginia [1, 2]. Originally developed to be accessed though a desktop PC, a 2-D digital map provides for random access based navigation of the virtual community. Collaborative tools placed at locations within the virtual community provide access to location related web pages and many other forms of shared content such as whiteboards, message boards, etc. The underlying software architecture supports both synchronous and asynchronous collaborative activities [3]. The current location model of MOOsburg is hierarchical, starting at the town level and working its way down through buildings and rooms, but allowing for other types of places/landmarks at each level of the hierarchy.

We are working with handheld devices, such as wireless PDAs, which can provide a convenient, personal user interface into the virtual space. The goal of user interfaces on these devices has generally been to simplify access to information even at the expense of not providing a large feature set. By taking advantage of location and other context models, we can simplify the access to information related to the user's needs and surroundings.

Other systems have integrated physical and virtual worlds. The design of the Jupiter system [4] at Xerox PARC allowed for the convolution of real and virtual (MOO) worlds. In the Jupiter system, it would be possible to dial from real phones into phones in the virtual world and virtual bulletin boards could be seen on public displays in the real world. The system would also allow for sensors in users' offices to show, in the virtual world, the state of things in the physical world such as office door: open/closed and telephone on/off hook.

The Internet Foyer [5] provides equivalent information between a physical foyer, a collaborative virtual environment (CVE) foyer, and a web based foyer. People in the physical foyer see graphical representations of people in the CVE and web foyers projected on the wall. People in the CVE and web foyers see video from the physical foyer integrated with graphical representations from the other virtual foyer. An open audio connection also exists between the CVE and physical foyers.

The following section provides two scenarios that are examples of the interactions that we would like to provide in MOOsburg.

3 Example Scenarios

Within the Center for HCI at Virginia Tech, we plan to integrate wireless collaborative meeting place technology into our conference rooms. Each electronic whiteboard will be tied into a parallel virtual whiteboard in MOOsburg with collaborative applications supporting generic whiteboard use as well as typical meeting place activities such as presentations and brainstorming. Sensors and other wireless access information will provide information to remote participants in MOOsburg about the people and activities in the physical conference room. Peripheral display(s) in the conference room will show information about the remote participants. Laptop/desktop as well as handheld applications can then provide personal access into the virtual space.

While on a trip, Joe wants to attend a regularly scheduled design meeting that takes place in the center's conference room. He connects into the conference room with his handheld through MOOsburg. His friend Sue, noticing his arrival on a peripheral display, sends a chat message welcoming him and asking about his trip. As the meeting begins, Joe's handheld coordinates with the applications being run on the whiteboard so that he can see the content and contribute. First the whiteboard is used for a status presentation by one of the team members. Then, the team uses the whiteboard to bring up their design from last week and proceeds to make improvements.

This scenario demonstrates the need to provide access to information in multiple worlds. Information was needed in the physical meeting room as well as in the virtual place. This shows how location models need to support a relationship between parallel places. In MOOsburg, the model should use a "separate but equal" policy, as places can require coordinated information or disjoint information. For example, two disjoint meetings can occur at the same place, one in physical world and one in virtual world. The location model also needs to support finding a previous state of shared data. This information needs to be available in both the physical and virtual worlds. For example, we may want to look up information on the state of a whiteboard at the conclusion of last week's meeting, despite multiple uses of that whiteboard since the meeting. This information might be used at the start of a physical meeting next week or be used for desktop reference by individuals throughout the week virtually via MOOsburg.

MOOsburg is interested in supporting collaboration among community groups. The streams project is a cooperation between three groups: SEEDs (Seek Education Explore Discover) and the Virginia Tech Museum of Natural History, both with offices in downtown Blacksburg, and the Virginia Water Resources Research Center, located on the Virginia Tech campus. The cooperative goal of these groups is to monitor and preserve Stroubles Creek. The creek runs through downtown Blacksburg and the Virginia Tech campus, underground in many places. For monitoring activities, 200 ft. by 200 ft. areas are measured off along the creek. Generally, SEEDs typically works with water analysis, the museum (through the Save Our Streams project) counts invertebrates, and the water center performs visual assessment of what is going on in the environment around the stream.

Bob takes a small group of middle school students from the museum to a measured downtown section of Stroubles Creek for the Save Our Streams (SOS) project. As they begin to wrap up their invertebrate count at the creek, Bob is entering the numbers on his handheld and notices that the number of Mayflies for this area is considerably lower than it was at this place last year. Determined to show how changes to the creek can affect these numbers to the students, he connects into SEEDs office via MOOsburg and checks for recent water analyses near their location. He finds data just upstream that shows chemical change over the past year and discusses with the students how these changes affect the insect population. Then Bob moves on to information from the Water Center where he steps through visual assessments, up the stream, discussing at each assessment site what environmental changes may have affected the water quality.

The scenario demonstrates the need to support different notions of proximity within a location model. Bob needs information based on the SOS activity. A location model needs to use this context as well as his particular location to provide appropriate information. The offices he acquires data from are located on the other side of town and providing information from unrelated locations in between would be excessive. Better understandings of context can simplify the information that needs to be provided to the user. The stream provides an example of a more complex geographic entity as a directed path. Paths curve and do not preserve straight-line distances. Also, a person's location along the stream determines the upstream and downstream sections, where events upstream can influence the current location.

4 Conclusion

Our work with MOOsburg reveals the need for location models to support two complex requirements. The integration of virtual and real spaces involves numerous issues when relating parallel spaces. Different notions of proximity can be very complex, requiring unique descriptors. Analyzing MOOsburg with respect to location models revealed these requirements. Further analysis of MOOsburg or other applications could identify additional challenging requirements.

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