GAMA-Mall – shopping in communities

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Abstract. In this article, we consider market places as social places. Social places provide social presence and interaction. Virtual market places often lack in these social factors. Community support tools, such as chat systems or newsgroups try to fill this gap. We argue that a new architecture is needed that brings together customers with common interests. We propose a combined system called GAMA-Mall based on a spatial representation of the shop, which implements this architecture.

Introduction

During the last years, virtual presences of shops, so called virtual market places, have grown rapidly (e.g. virtual bookstores such as www.amazon.com or internet shopping malls such as shopping.yahoo.com). The design and the implementation of these shopping places has primarily focused on the process of exchanging goods. Online catalogues of mail-order companies were created and metaphors of shopping baskets and virtual cash desks were introduced.

While these metaphors aim at easing the process of shopping by emulating real world experiences, current virtual market places often lack in the emulation of the social factor. The customers are mainly kept separated and everyone is shopping as if he was in an empty shop.

Voices for social market places

A growing number of authors has recently argued for establishing communities in virtual shops. Marathe [13] states that "people don't like to shop in an empty store." To substantiate this thesis, he cites a survey which shows that 90% of shoppers prefer to communicate while shopping. Preece [14] argues for a community centered development of online communities and proposes an integration within E-commerce web sites. She states that online communities can help shop sites to establish trust and to draw people to their web site. Participate.com [20] argues for shopping communities because they "increase stickiness (customer loyalty), [and] viral marketing (word of mouth), reduce [the] cost of customer acquisition, and drive higher transaction levels."

Levine, Locke, Searls, and Weinberger express the importance of social factors in virtual market in a more provocative way. In "the cluetrain manifesto" [11], they state in 95 theses how life and cooperation will take place in virtual markets. Some of these theses help to enlarge our definition of a social virtual market:

"1. Markets are Conversations. […]

11. People in networked markets have figured out that they get far better information and support from one another than from vendors. […]

12. There are no secrets. The networked market knows more than companies do about their own products."

Historic Observations

The history of market places reveals that they have always been places for social contacts, communication, recreation, or exchange of news, even if in current implementations of the virtual market places these factors are often omitted.

Herodotus [7] reports on the importance of market places for consulting. He wrote that ill people were carried to the central place in the city of Babylon. Every person who passed a patient had to stop and ask him about his disease. Then the passer-by had to give advice, if he had comparable diseases before. It was strictly forbidden to pass by without talking to the patient. This example shows how different social needs were satisfied at one locale.

The Greek agoras and the Roman forum were initially political gathering places. But very soon they became market places as well. They were the central points in a city, where people not only discussed and traded, but also spent their spare time. In many cases, the trading crowd grew so large that political discussions could not take place anymore. In Athens, they therefore separated the political place from the market place. Aristotle [1] argued for this separation, to keep the politics free from commercial influences. On the other hand, it is proven that Socrates found his partners in discussions at the agora.

The Goal

Virtual market places reduce stores mainly to the presentation of goods. Other customers and salesmen are no more co-located in one store. They don't feel the presence of others and social contacts are often not established in the store.

We therefore argue to combine the virtual market with a social place again. Customers who participate in the virtual market should change their role: from consumers to people, who want to satisfy their wide range of needs. The purchase of goods is one of them, social interaction, learning, or excitement are others, which can be satisfied in a community. The role of markets that bring together people, who did not know each other, could create new social communities. If the members of the community are encouraged to exchange their ideas and their knowledge, this could have a large impact on all brands of live, as the discussions at the agora had large implications on ancient philosophy. The more interesting the community is, the more attractive will the market place be.

In the remaining part of this paper, we will first take a short look at current technologies for community support in shopping sites. After that, we will present an architecture for a social market place and discuss different possibilities for the implementation of this approach.

Online communities at E-Commerce sites

Current implementations of virtual shops differ widely in their support for communities. For the focus of community support, the solutions can be distinguished by the following factors:

- the activities can be *synchronous* (same time) or *asynchronous* (longer periods of time between two statements);
- communication flow can be possible between business and customer (B→C), customer and business (C→B), and customers and other customers (C→C);
- results can be captured (*persistent*) or non-lasting (*transient*);
- communication can be initiated by business or customer;
- the formation of the involved (sub-)group of the community can be based on the website, buddy lists, or personal (current) interests;
- the tools can provide awareness or not;
- and the tools can provide means for shared experiences (performing a group task together).

Table 1 provides a classification according to the above criteria. In the following paragraphs, we will compare the different solutions according to table 1.

The most common support for social interaction is provided by e-mail. Customers can request information by e-mailing a sales representative and hopefully receive the desired information afterwards.

Newsletters allow to broadcast information from vendors to customers. This technology is widely used to advertise new products or special offers. In some cases, the customers can express their interests by configuring agents that look for specific topics. If the agent finds a product of interest it notifies the customer (see for instance the German book seller www.mediantis.com for an implementation of personalized agents).

Bulletin boards or newsgroups add the communication channel between customers. Since all customers can read all messages, knowledge can evolve within the community. This is why newsgroups can provide a basic impression of shared experiences. Vendors normally participate in the newsgroup and answer questions or guide the discussion in a desirable direction. Many newsgroups on e-commerce sites are moderated, which means that the vendor filters the messages and publishes only those messages that are desirable.

Mail, newsletters, and newsgroups all base on asynchronous technology. Vivid interaction is thus very complicated. Many systems are nowadays integrated within and accessed through the website.

	e-mail	News-letters	News-groups	Chat	IM	Odigo	Human-Click	GAMA-Mall
Communication								
Asynchronous	•	•	•			(•)		(•)
Synchronous				•	•	•	•	•
B→C	•	•	(•)				•	(•)
C→B	•		(•)	•			•	(•)
C→C			•	•	•	•		•
Persistence	•	(•)	•			(•)		(•)
Initiator								
Vendor		•					•	
Customer	•		•	•	•	•		•
Group building								
Web Site	•	•	•	•		•	•	•
Buddies				•	•	•		
Interests			•				•	•
Awareness				(•)	•	•	(•)	•
Shared experience			(•)	(•)		(•)	•	•

Table 1. Current technology used to support online communities at web sites. A "•" means that the feature is supported by the technology. If the "•" appears in parentheses, then the feature is only available for the customer or the business, or the feature is not possible, but not intended with the technology.

Synchronous technology is dominated by chat systems. These systems allow fluid conversations by the exchange of short messages in a chat room. The content of the chat is visible to all participating users and all users can send contributions. Some chat rooms organize special events, where many users meet with experts (e.g. chats with authors on virtual bookstores). These events help the community to gain shared experiences. The chat communication is initiated by the customer when he enters a chat room web page. The page is normally a designated page at the vendor's site.

Instant messaging (IM) systems (such as ICQ or AIM) allow the users to keep a buddy list. Whenever a buddy comes online, this is indicated by a sound or a flashing icon. Thus, these systems provide awareness on the other members of the community. Most IM implementations are stand-alone applications. An integration within web pages is found rarely (an example is given at the end of this section).

Both, Chat and IM, do not support persistence for the community (users can save chat logs, but there is no integrated mechanism to bring these logs back into the community). They provide basic awareness information but only poor shared experiences, because the conversations held in the chat take place within subgroups of the community. The experiences of the subgroup are not transformed into experiences of the community.

Several research prototypes have addressed the activity of co-operative browsing. One of them is the proxy based approach, which was presented by Cabri et al. ([4]). In this approach, users can see what pages other members of their community are currently viewing and they can join browsing in a master slave manner: One user navigates and the content of all other browsers follows this user.

Odigo (www.odigo.com) combines the IM systems with the presence awareness of other users, who view the same website. Users can detect and contact other users, who are currently at the same web server (pages are not distinguished). When two users found one another, they can chat or browse the web together. Anyhow, the granularity of the awareness information is quite coarse: knowing for instance that another user is currently at amazon.com can imply anything. Thus it will not necessarily create communities with common purposes or interests.

An integration of co-operative web browsing in a shop system can be found in the HumanClick system [8]. This system allows site owners to see who is currently visiting specific pages and they can contact this user using a chat tool. If a contact is established, the sales person can initiate a cooperative browsing session, where she is steering the local user's browser.

We propose that for a social market place the system provides awareness between users who share the same section of a shop. The definition of sections should be topic centered. For instance, if two users currently browse crime stories by Agatha Christie, they share this current interest. They should then be able to start a synchronous communication and discuss their current interest or exchange their experiences of crime stories. At this point, they form a community of purpose (they go through the same process of browsing crime stories), but this community may soon mutate to a community of interest. That means that there is a new group, which shares a common interest and passion – in the example the passion for crime stories. These communities have shown to be sticky, which means that the members will return frequently to be aware of any activities in the community (cf. [13]). Besides discussion, the group should be able to perform other tasks together and thus gain shared experiences (which also leverages the identification with the community). These activities may include cooperative web browsing or the cooperative writing of a review. The following section will show how such an environment can be built.

The GAMA-Mall approach

We propose an architecture that eases partner finding and collaboration in virtual shopping sites. The architecture is called GAMA-Mall. The basic idea for contact facilitation of our approach is the one of focus and nimbus, as it was suggested by Dourish and Bellotti [5] and generalized by Rodden [15]. They interpret the collaborative virtual environment in a spatial way. Each artifact, which is used by the group, is placed at a specific position. If a group member is currently working on the artifact, he focuses it. The nimbus forms an area around the focused artifact. It "represents an observed object's interests to be seen in a given medium" [6]. Rodden transfers the ideas of focus and nimbus to general graph structures. Nearness is, according to Rodden, defined as the set of adjacent artifacts in the graph.

With GAMA-Mall, we propose to apply this generalized model to shopping web sites. Whenever other users enter the local user's nimbus, this is visualized to him.

For visualization, the designers of the collaborative web shop have to carefully create metaphors of space and presence. The metaphors have to be intelligible, so that they do not add additional cognitive load to the user. They have to be more intrusive, when the other user reaches the center of the local user's nimbus (the focus).

Awareness information serves as a means for locating potential partners. When the partners have found one another, they might start tighter collaboration. This should be supported by the system by offering tools for negotiating the upcoming collaborative activity, as well as tools for actually performing the collaborative activities.

We identified seven steps of how to introduce awareness information and collaborative tools to shopping web sites. The steps are as follows:

1. Analyze the artifacts and the relation between them.
2. Build spatial metaphors and define computable mappings between the physical representation and the metaphoric representation.
3. Find (or build) metaphors of activities that describe the users' actions.
4. Add a user representation to the application.
5. Identify the parts of the application, where the attachment and detachment of metaphors is best performed.
6. Insert additional layers at the identified parts of the application for detaching and applying the metaphors.
7. Identify and add additional tightly coupled collaborative tools.

After this overview of the required steps, we will discuss each step in a separate subsection and show how to perform this step in the example of a virtual bookstore. Note that we do not intend to provide exactly one solution. The goal of the following discussion is rather to highlight different alternative ways of how to implement a social virtual shop.

Artifacts and Relations

When considering web shops, there are several artifacts that may be of interest to the user. The selection of artifacts for the GAMA-Mall is driven by the constraint that each artifact has to be a possible focus of a user. Therefore, the goods are the most obvious artifacts. In most virtual stores each good has a virtual representation in forms of a HTML page. Other artifacts serve as groupings for goods. In real stores, goods are presented using shelves. Categories fulfill the same purpose in virtual stores.

Taking the pages of the amazon.com bookstore as an example, GAMA-Mall first identifies the currently displayed book, author, or category. These three classes are the artifact classes. An author is related to the books he wrote and books are classified in categories. The pages at amazon.com provide additional information that shows which books are alike.

Spatial metaphors and computable mappings

The mapping between the identified artifact's representation in GAMA-Mall and their real representation in the store is quite straightforward: Each artifact is represented by its URL. Parsing the artifacts representation in the shop site creates relations. For each link, the GAMA-Mall removes personalized information (such as session indicators) and then calculates the internal representation based on this generalized URL.

For the pages at amazon.com, the system performs a mapping to artifacts and relations in the GAMA-Mall representation by parsing the address of the current HTML page, which includes the book's unique ISBN or the author's name. The next step is to parse the page's content and find other artifacts. This is done by analyzing targets of hyperlinks and interpreting the hyperlink's destination based on the link's structure.

The spatial arrangement, which is needed to apply the Focus-Nimbus model, is calculated from the graph of artifacts. Distances have to be applied to the relations as a prerequisite. Each link's distance has to conform to the semantic nearness of the artifacts, which the link is connecting.

The GAMA-Mall uses a very pragmatic approach to calculate distances: When analyzing the artifact, the system counts all links on the page and all pages that link to the target. The artifact's link's distances is then proportional to both values. Thus, two pages that have only links to one another are connected by very short distances.

The analysis could benefit from some more sophisticated algorithms (e.g. the algorithms provided by [9]), but on the other hand, this calculation forms a bottleneck in the whole system since it is done in real-time.

Another way for enhancing the structure of the spatial representation is to modify it according to the user's actions. We refer to this process as learning by browsing and have already applied and tested it in an earlier prototype in a different problem domain [18]. Whenever a user moves from one page to a related page, the two pages are moved closer together. All other pages are moved apart.

Metaphors of activities

When browsing virtual shops, there are not many different kinds of activities. Either, users are navigating through the shop by selecting different links, or they are looking for something specific by entering a search query. Both activities can be abstracted to *moving through the virtual store*, whereas the first kind is not as targeted as the latter. When considering possible spontaneous collaboration, the first kind of movement is of greater importance, since people who are browsing are more likely accepting an interruption for collaboration.

Within the GAMA-Mall, all movements are recorded and they produce a trail comparable to Bush's trails in MEMEX [3]. The only difference between GAMA-Mall and MEMEX trails is that the trails in the GAMA-Mall fade away. Fading follows the analogy of footsteps at the beach. If a user has walked there recently, one can still recognize his trails. But as time goes by, the sand drifts away and the trails get very cloudy until a point in time is reached, when one can not distinguish the trails from the surrounding area anymore. If two users can sense each other's trails, they are possible partners for social contacts.

Another activity in shops is the *purchase of goods*, but this should be performed privately and not shared (e.g. for security reasons of payments). As a third activity, users can *co-operate*. The results of co-operation could again be of interest for other user's and awareness on other user's co-operation could attract additional user's to join the co-operation. Unlike single user's browsing activities, co-operative activities should not fade away. The results (e.g. comments on a specific good) are kept and surrounding users are aware of them (by means of the focus-nimbus model).

User representation

Each activity has to be associated with a user. Therefore, the GAMA-Mall needs a way to uniquely identify each user and retain information about the user's current state. Using a shared object for the user representation solves the problem of associating the user's activity with the user.

The identification requires some traditional mechanisms: The most common way to identify users is by means of cookies. Another possibility is user identification by means of a login procedure.

Points for attachment and detachment of metaphors

Up to this point, GAMA-Mall can represent users and their activities.

We argue for a proxy architecture to integrate users, activities and the spatial representation with the web pages of the shop. Loutonen and Altis [12] defined a WWW proxy server as a computer, which "provides access to the Web for people on closed subnets who can only access the internet through a firewall machine.". Another frequent application of proxies is caching of web pages to shorten response time. But, as described e.g. by Thomson [19], proxies can also modify the page's content. Modifications range from automatic outlines for better readability in the Zipper system [2] over the removal of unwanted information (such as banner advertisements in WebWasher [21]) up to automatic translation of web pages (e.g. [10]).

For the purpose of awareness on web pages, the proxy adds some awareness clues in to the retrieved page. Therefore, the GAMA-Mall proxy monitors the accesses, generates a spatial representation, and calculates and adds awareness information. The user has to configure his web browser in a way that all requests are made to the GAMA-Mall proxy. For cases where the user requests pages that are not a part of the shop, the proxy can behave like a HTTP gateway.

Layers for detaching and applying the metaphors

Within the proxy, the awareness information can be calculated according to the focus-nimbus awareness model as it was described at the beginning of this chapter.

Whenever a user performs an activity on an artifact, this activity has an impact on the artifact and on all surrounding artifacts. The original activity is called source activity, whereas all calculated activities on surrounding artifacts are called dependent activities. If the access was for instance a view access, the proxy adds this access to the artifact. Then it searches for all surrounding artifacts and adds the dependent view access to these artifacts as well (with a lower intensity to signal a larger distance to the source activity).

One possible way for visualizing nearby activities is by adding awareness indicators in front of the artifacts. We have gained some experience with presence indicators that show how far away other users are working in the nimbus [18]. In the GAMA-Mall prototype, we use little colored figures, which are placed in front of the artifact's representation. The more red paint is used to draw the figure, the closer another user is. Colors range from dark red to green, which can be expressed as a mapping of the activity's intensity to the figure's hue.

A concrete example of the calculation of figures is shown in figure 1. It shows three different books, which are all in the same category. The books are written by two different authors and one of the books is written by both authors. One user is currently viewing the book *b3*. This implies that figures are shown in front of all the other artifacts according to the distance between *b3* and the other artifact.

The figures are combined with context information by using the capability of naming figures in HTML. The name of the figure reveals who is working nearby and where he is working on. Thus, the user can decide if it is worth following the link to the other user. Besides the context information the figures also provide access to detailed collaboration information and synchronous collaborative tools. These tools will be explained in depth in the next section.

Figure 2 provides a design study of the visualization. In front of each link that leads to an artifact GAMA-Mall added presence indicators. If a user has left a page the GAMA-Mall will still show the awareness indicator for his viewing activity, but the intensity will vanish over time. We model this ageing presence indicators by reducing the source activity's intensity, after a user has left the page.

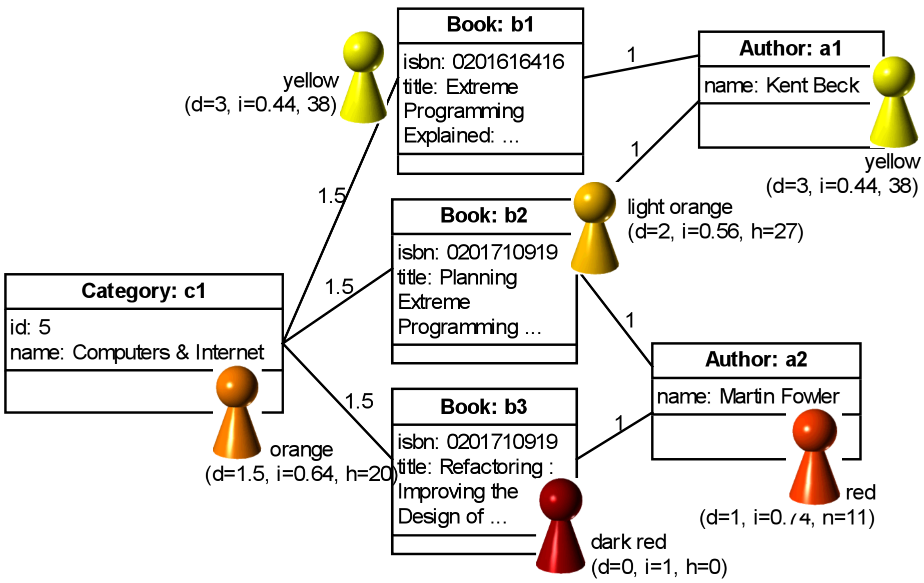

Fig. 1. Calculation of awareness indicators. The tuple below the color names includes the distance to the source activity, the resulting intensity, and the figure's hue.

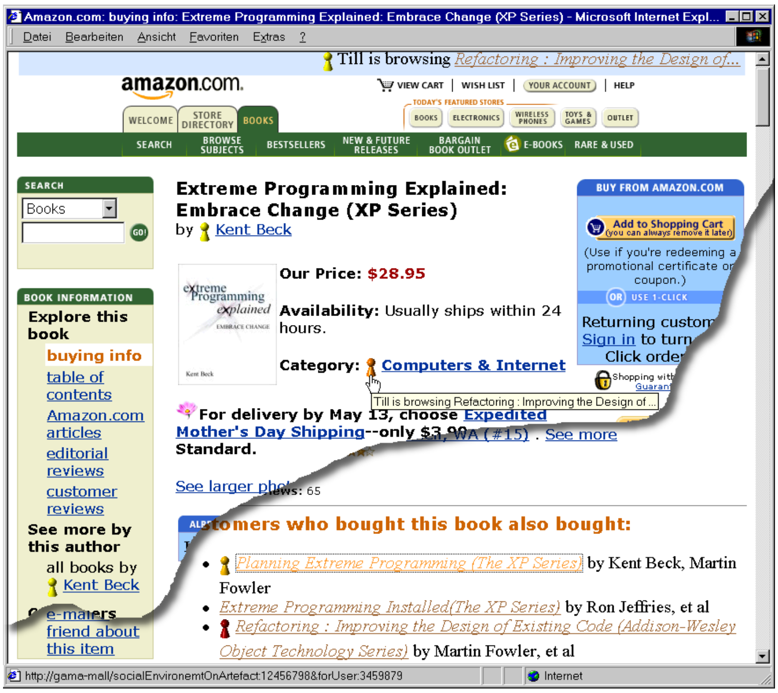

Fig. 2. Design study of awareness indicators in a the virtual bookstore (for space reasons, two screenshots were combined to show two different parts of the document).

Tightly coupled collaborative tools

Without additional means for co-operative activities the awareness indicators would be quite useless. Therefore, users should be able to do something together, when they meet. Taking into account the real world setting, the most obvious activity would be to *chat*. Chats can be without any goal or they can be goal centered. Especially the second kind of chats is important for communities, since it produces reasonable events. Besides chatting, visitors can join and *browse through the shop together*. If they have noticed that they are looking for goods within the same topic they could find the desired good faster. Different strategies can be useful: co-operative and concurrent browsing.

Co-operative browsing would mean that they look at the same information in the shop. They can then discuss about the information and come to a mutual agreement, what related goods or shelves are the most promising ones for further inspection.

Concurrent browsing means that the group members browse the shop on their own. The GAMA-Mall can assist them by indicating which pages have already been visited. Thus, they will not visit pages that have already been visited by another member of the current browsing group. The group can capture findings in a cooperative chat, as it was described in the section above. They could also generate a report on their browsing experience using a synchronous cooperative text editor (the same editor that we used in the programming environment TUKAN [17]). Within this editor, each user can type and each user has a personal text cursor.

All synchronous cooperative tools can be launched using the social environment inspector. The inspector opens whenever a user follows the link of an awareness indicators and displays a web page with additional information about the other user and links that launch the synchronous tools.

All synchronous tools go beyond the technical capabilities of current web browser technology. Thus, the synchronous tools are implemented using the COAST framework for the creation of synchronous groupware [16].

Conclusions

Within this paper, we presented an architecture that introduces social presence and eases group formation based on the user's current interests. Community support exceeded traditional solutions primarily in the area of awareness, where we applied a focus-nimbus model. The awareness information was complemented by synchronous tools for spontaneous co-operation.

The system is currently under development and we gained first results concerning the behavior of the proposed proxy. It was possible to parse pages and monitor accesses as described in the sections above. The visualization is working fine. The synchronous tools have been used before in a synchronous programming environment and worked well.

The calculation of the nimbus and the parsing of the HTML pages revealed to be the most time critical parts in the architecture. Anyhow, we have already solutions in mind to balance the load on different servers. Since all information that is needed by the proxy for its calculations is modeled using shared objects, the distribution on different proxy servers is straight forward.

All these experiences encourage us to carry on with the development and create a scalable version soon. Then it will be tested in the field and we hope to get a critical mass of testers to test and proof our hypotheses that communities of purpose and interest gain real support using the tools.

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