Serefind: a Social Networking Website for Classifieds

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ABSTRACT
This paper presents the design and implementation of a social networking website for classifieds, called Serefind. We designed search interfaces with focus on security, privacy, usability, design, ranking, and communications. We deployed this site at the Johns Hopkins University, and the results show it can be used as a self-sustaining classifieds site for public or private communities.

Categories and Subject Descriptors
H.3.5 [Online Information Services]: Web-based services

Keywords
Classifieds, Search Interfaces, Security and Privacy

General Terms
Design

1. INTRODUCTION
Let us consider the typical method of interaction between buyers and sellers in classified settings. When people want to sell something, they advertise by way of a physical or virtual announcement. For example, an individual puts up a flyer in a neighborhood to attract local buyers. People who are interested in the classified listing contact the owner either by phone or email. The two parties communicate until the deal is consummated or falls through. In this paper, we address problems related to security, privacy, design in available classifieds websites, and then propose design and implementation of Serefind: A social networking for classifieds.

2. BACKGROUND
The growing prevalence of Internet access has enabled classified communications to emerge online. There are hundreds of web-based services for this kind of classifieds communication. For the sake of simplicity, we will only review top classifieds websites according to alexa-web rank. One popular example is Craigslist\(^1\), which according to alexa-web rank, is ranked 45th in the world. This website contains classified data on a large scale. It has various problems related to security, privacy, design, and usability. There exist hundreds of cases showing that use of this website has lead to crimes such as kidnapping, threats, and prostitution.

Another example is EBay Classifieds\(^2\) which also facilitates classified transactions. Some sites such as Amazon are e-commerce websites where people can buy items, but these have a different structure than classified websites. Some social networking websites such as Facebook provide a framework for third-party classified applications to leverage an existing social graph. Facebook Marketplace\(^3\) powered by Oodle, a third-party company, is an example of this kind of application. Third party association creates various privacy related issues.

3. DESIGN GOALS
Our design goal aimed to create a social classifieds site that satisfies the following constraints:

Security and Privacy
The identity of anyone who uses the website should be verified to reduce crime. For example, on Craigslist, interactions can occur without thorough verification on either side. If an issue arises, since there is no verification, it is difficult to trace the individuals involved. Furthermore, all websites should strive to meet the web based security standards.

Social-Graph
Today we live in the social networking era where we conduct social experiences online via computers, hand-held devices, and gaming consoles. Social networking is changing our way of communication, allowing us to easily share information with our friends, family and peers. Online marketplaces can be visualized using various social graph models\(^4\). Social network and commerce networks are interconnected to each other\(^3\). To make it simple, we present a social graph that can be visualized using a graph with nodes and edges. Node represents be owner (circle) and classifieds stuff (square). A solid edge represents ownership of a listing, and a dashed edge represents interest in a listing from a peer. Total message count for communication regarding a listing is repre-

\(^1\)http://craigslist.org
\(^2\)http://ebayclassifieds.com
\(^3\)http://apps.facebook.com/marketplace/

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WWW 2013 Companion, May 13–17, 2013, Rio de Janeiro, Brazil.
ACM 978-1-4503-2038-2/13/05.

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and email settings.

to access these sections. Users can set network, password
sures security. The navigation bar at top of the site is used
example the user with
Johns Hopkins University
network. This verification en-

sented with a number above the edge. One of the design
 goals is to follow the above social graph model (See figure 1).

Design, HCI and User Interfaces
Sites should use suitable Human-Computer Interaction tech-
iques to enrich the user experience. Users should be able
to provide information in a user-friendly manner. Classified-
data should be browsed with usable search interfaces.
Communication between users should be easy and efficient.
As for advertisements, minimal use of banner and text ads
would enhance the user experience. In addition, the site
should be aesthetically pleasing, on par with or more so
than existing classifieds sites, while maintaining an aura of
safety and minimalism.

Ranking Algorithm
The site should use a sophisticated ranking algorithm to dis-
play appropriate and relevant results from a large database.
For instance, we can incorporate serefind social graph ele-
ments such as interactions and communications to provide
an improved ranking algorithm.

In the next sections, we will present the design and im-
plementation of site by describing user-interfaces, ranking
algorithms, and the design of communications.

4. SEREFIND SYSTEM
Figure 2 shows the Serefind user-interfaces. Serefind has
three main user-interfaces 1) Search interface 2) Profile, and
3) Communication. In addition we have authentication, set-
ings and help interfaces. Serefind users have to register with
a well-defined email address affiliated with a network. For
example the user with pramod@cs.jhu.edu will join The
Johns Hopkins University network. This verification en-
sures security. The navigation bar at top of the site is used
to access these sections. Users can set network, password
and email settings.

After registration and login, the user visits the Search
Page (default home page) that displays recently added clas-
sified listings in the form of a Newsfeed. This is important
because it shows users that the site is being used. By de-
fault, the Newsfeed is displayed based on personal prefer-
ences, such as location, network, and categories. We also
provide a link to customize preferences.

4.1 Profile
In a social network, a user’s Profile is a place where the
user adds and manages posts (classified listings in our case).
Profile UI and its elements can be used to signal other user
nodes and connections[5]. We had the following require-
ments for the Profile metaphor.

Heterogeneous Data Sharing
To support all kind of heterogeneous classifieds data, we
have developed a template based framework, where all the
specification for categories can be written in the form of xml
files. This approach assists to create new categories and
their specification directly from users with administrative
control (approval), without modifying the source code. Tem-
plate also mentions specifications for the search. For exam-
ple following code specifies Event category in the event.xml
. Database stores information according to the XML defini-
tion. UI is displayed based on XML file.

This is a unique approach compare to the existing websites
such as Facebook, Twitter, etc., which only allow a user
to post specific types of information. In theory, Serefind
can be used to post any type of information beyond classi-
ﬁeds even tweet and Facebook like post. We just have to
put related XML file with speciﬁcations in the system, and
Serefind search and post interfaces will be changed auto-
atically. In addition, We also implemented an interface in
which users can request new categories and their respective
fields. After approval from administrator, new categories
can be part of Serefind without source code modiﬁcation.

Security and privacy
By default, at the Profile page, we do not display full name,
location, photo, or any other information about a user. We
simply display a username and set of listings. We do not
show any messages regarding these listings. If the user is
not signed in, most details such as description, user name
are hidden by default. In addition, users can explore listings
belonging to their own network. However public listings are
visible to all the networks.

Post listings
By default post interface shows HTML input elements for
category, subcategory, tags, title, and description. The user
can enter data in profile according to which classified cate-
gory the data falls under. The Profile is designed using intel-
ligent interactive methods to make data entry and repetitive
data entry easier and more usable. After data is entered, ad-
dition of the entry is confirmed and the user is immediately

Figure 1: In figure, user A owns a classified stuff P
(solid arc between A and P) and user B is commun-
cating for that item (dashed arc between P and B).
Arc between B and classified node P becomes solid
and Arc between A and P becomes dashed, because
it has been sold from user A to B.
able to add another listing. Users can add more input-fields according to their need.

**Manage Listings**

The user can manage listings by using the edit, delete, or hide links provided for each listing. We also provide an undo button if the user deletes or hides a listing by mistake.

**Navigation**

For a user to view the profile of another user on the lightbox and listing page, we provide a link to the owner’s profile. Another way to access a specific user profile is to visit http://serefind.com/directory/profile/[username].

**Other Interfaces**

For a user to determine if their listings are being viewed, we display the number of views for each listing when the user visits profile. This allows the users to see how many people are viewing their listings and perhaps serves as impetus to make changes if the listing is not being viewed or the listing is being viewed and no responses are being generated.

### 4.2 Search Interfaces

Search interfaces play an important role for any data-oriented website or system. Researchers have attempted to improve conventional interfaces [6]. We set the following requirements for Serefind to ensure optimized design and usability.

**Data Visualization**

Serefind is a data driven site. We provide few classified categories such as books, furniture, apparels, electronics, housing, sales, service, and jobs. Without proper visualization and interface, users cannot interpret data and interact regarding data. We choose the following user interfaces to visualize classified data:

1. List View: Each listing contains basic information such as icon picture, title, user name of owner, description, network, category, subcategory, and date posted. More details are displayed in the left side of listings on mouse over on expand icon.

2. Thumbnails View: This is a visual search in which we only display pictures and title.

3. Map View: We used the Google Maps API to visualize location based classifieds data. This feature is useful when a user is searching for data in a particular location and is also useful in increasing the relevancy of data by showing listings which are nearby to the user.

4. Tabular View: In this view, results are displayed in a tabular format so that user can easily view and sort.

5. Item Pages: These pages contain the full set of details regarding a listing. A lightbox appears on the right side of the page when a user selects a listing by clicking on the title or picture. This lightbox method allows the users to preview the listing and decide whether he is interested in pursuing it further. It also provides a link to the listing page which contains complete details of that classified listing.

6. Lightbox: This is a simple overlay that appears when a user selects a listing. This helps to explore details without redirecting to the item-page.

**Page Scrolling**

We use AJAX based infinite-scrolling method to see more results. During the scrolling, top and side navigation bars remain fixed.

**Sorting and Filters**

We display category menus and search filters on the left side of the site. Tabular view also displays column-links for sorting the results.

**Navigation**

How can a user reach appropriate results? We designed the interface in such a way that users can access information in three steps. In the first step, a query is invoked. The second stage is the browsing step, in which the search results are represented in a set of relevant listings displaying name, title, price, and description, and the user can browse these listings and select those which he is interested in. The third step involves the display of a lightbox when users select a listing. At this point, the user can communicate regarding a listing or go to the listing page to view more information.

**Communication**

For users to communicate with owners during a search, We placed a message box at the bottom of the lightbox.

**Other Usability Factors**

How we ensure usability? We considered many usability-related problems for search interaction. For instance, to
minimize user time and effort, we introduced an instant search on each page. Another simple usability problem is how the user can view multiple listings in an efficient manner. We use a lightbox or instant overlay at the right-hand side of the page so the user can view N listings with N clicks.

**Ranking Algorithm**

Our social classifieds system can be represented with a graph where owners and their classifieds listings are represented respectively as nodes and their edge relationships are described as a foreign-key in their respective relational database schemas.

A classifieds C can be represented as C(O, c1, ..., c_k) where O is the owner and c_i is the attribute such as title, description, price, username, etc. Search query can be represented as Q(U, q_1, q_2, q_3, ..., q_n) where U is the user who invokes the query and q_i is the search term(s). The similarity score between a query term Q and classified nodes C can be represented by Sim(Q, C) = \sum S(q_i, C), which can be calculated by various Information-Retrieval (IR) based methods such as TF-IDF and RF [1]. To provide better search experience, we used Location Based Service (LBS) and Query Expansion (QE)[2] methods to optimize the search results.

### 4.3 Design of Communication

Communication is the basic step for any classifieds website or social networking website. On popular websites such as Facebook, Gmail, there exists an Inbox metaphor for communication. Serefind Message section contains interfaces for inbox, sent, and deleted messages. Our site was designed for classifieds, so the design of communication has the following constraints and requirements:

**Initiating a Communication**

How does a user initiate communication? When users are searching, they can directly send a message to the owner using the send message UI at lightbox which appears when a user selects a listing. User can also send message on Item-Page. This creates a new message associated with a particular listing, thus automatically providing a context for each message exchanged.

**Security and Privacy**

How we ensure privacy and security? Users can view and delete their own messages or comments. In addition, usernames are also in the form of a self-assigned moniker. Because each user has to register with a valid organizational email, we can track any issue or crime originating with a communication on the site.

**Context of Communication**

What will the subject line be? Traditionally, in an inbox-based system, users are allowed to message any other user without any context or subject line. We present listing title as a subject or context for the communication.

**Notification**

How can users access new messages? Serefind generates email notifications with a link to the inbox. Here we faced and experimented two different design options. Should we send an actual message within the email notification or we should provide a small message to login to the site to read a message? In the first approach, instead of reading a full message with a link for replying message, a few users sent the message to support@serefind.com because after reading messages they were confused about the identity of the sender. The second approach seemed solid but slightly less convenient, because users have to login to the site to read complete messages. Within the site, we provide a notification on the top bar indicating number of new messages.

**Special-Cases**

What happens when an owner deletes a listing? In this situation, users who previously communicated regarding a listing can view all past communications. However, users cannot send further messages to the owner of the deleted listing.

5. CONCLUSION

We implemented Serefind using open-source technologies such as PHP and MySQL. To provide better user experience, we are using AJAX to lessen page refresh time at various places in the site. The site was launched at Johns Hopkins University. Currently site has approximately 10,000 users who belong to The Johns Hopkins University and nearby schools networks. At the time of the experiment, the website’s alexa world web rank was 17,802,775 on a single network.

We believe our work will be a better model of a classified system by focusing on design, usability, communication, search, and security. Serefind interface will create an optimized user experience for those interested in an alternative to the traditional classified system. A demo is available at [http://serefind.com/demo](http://serefind.com/demo).

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