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Removing the Digital Divide for Senior Web Users

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Removing the digital divide for senior web users

CS298 Final Report

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1. INTRODUCTION

It is hard for the elderly to use the internet to find the resource they want. Usually help is needed for them to complete the task on the technology things. The main reason for this project is to research ideas on encourage senior people to make use of the web to locate helps they want, such as finding volunteers and professional helps. The scope of this project is to develop a new way of web access and content presentation methodologies that let senior people getting help from volunteers and various service providers more easily that incorporates social networking technology e.g. Facebook.

By incorporating the social network web site like Facebook into the web application, senior people will be able to find volunteering help or other related service providers through social networking. Volunteers will show up in Google map in search results for senior to easily locate helps. Senior people can also search for self help videos tutorials through the web application search engine.

A mobile version of the senior user application will also be developed for easy access on the road. Other features that benefit senior users includes voice input, control / content posting and collaborative social networking where a sponsors would sponsor a help task volunteer undertake.

2. PREVIOUS WORK

• Researched how to access Facebook data using the Facebook API, FQL and FBML.
• Researched information sharing between external web application and Facebook user account.
• Implemented Facebook video sharing application based on the Drupal web framework.
• Implemented Facebook account membership linking with external web application account.

3. INNOVATIONS AND CHALLENGES

• There are currently no easy to use online helping tools for low-tech senior people to locate volunteer help.
• There is currently no mobile application for senior people to locate volunteer help.
• The goal is to implement a web application that is easy to use for low-tech senior people that incorporates social networking technology.
• The project makes use of the popular Google map API for senior people to locate volunteer help.
4. LOCATION BASED SEARCH ENGINE

The HD4S website’s main page is a location based search engine that lets senior people to search for volunteers for hope. In Figure 1, it showed the search input fields, the first input is the help senior looking for, and the second field will enter the location where the volunteer located. The search engine also has keyword auto-complete feature which give hint for the search. After senior submitted the search, a Google Map will show the bubble which represented the volunteers located. Senior can click on any bubble inside the Google Map to get more detailed information of the volunteer that provides help.

![Figure 1 – search main page](image-url)
Figure 2 – keyword auto complete

Figure 3 – volunteer show up on Google map
Figure 4 – detailed information of the volunteer

Figure 5 – help in santa clara
Figure 6 – sponsor filter applied

Figure 7 – organization filter applied
Figure 8 – detail information of sponsor

Figure 9 – detail information of organization
5. FACEBOOK APPLICATION

Figure 10 – video help

Figure 11 – Facebook Application running inside Facebook platform
5.1 Pros for using Drupal for Facebook

- The main purpose of Drupal for Facebook is to show content of Drupal inside Facebook, for example, if a user posts some content (video, forum, comment) in Drupal, other users will see the content in Facebook too.

- User gets all Facebook API and feature and a large user base.

- User gets both power of Drupal (CMS) and Facebook (SN)

- Faster development since Drupal is already a CMS, one can get content up and running quickly.

- Since Drupal is mainly for CMS, Drupal for Facebook enable the Social Networking part to merge with CMS.

- Any one with a Facebook account is ready to post / upload content to CMS hosted by Drupal.

5.2 Cons for using Drupal for Facebook

- User got to stick with Facebook and cannot have a standalone site.

- Since Drupal has the Social Networking module also, it’s more customizable than Facebook, if a user stick with Facebook, a user need to follow rules set by Facebook.

- Must use FBML for some tasks such as video embedding.
• User of Facebook can choose not adding your application where a subset of Facebook user is Drupal user.

6. FACEBOOK API

6.1 Facebook Markup Language

The Facebook Markup Language is a sibling of the HTML where the FBML had some of the HTML tag removed from its language specification. The FBML is basically an extension to existing HTML while it is also a subset of HTML language. The FBML starts with the namespace <fb: for example, the following FBML will embed video inside Facebook website:

<fb:swf swfbgcolor="000000" imgstyle="border-width:3px; border-color:white;"

swfsrc='http://www.youtube.com/v/sodMI9LZXig&hl'

imgsrc='http://www.oniva.com/upload/1356/Rayeath.gif'

width='340' height='270' />

6.2 Facebook Application Configuration

User creates Facebook application by clicking on the Setup new application link and fill out all the necessary settings parameters such as hosting address, Callback URL.

Once the Facebook application name is entered, a set of security keys are generated, developer needs to use these secret keys to communicate between Facebook and their application hosted on their servers, furthermore, developer needs to tell Facebook where the application is hosted by entering the server IP address.
### 6.3 Facebook Client

Using the facebook client API involve several steps:

#### Facebook Client

Using the facebook client API involves several steps:

**Figure 13** – After created application, user can edit details of the app

![Figure 13](image1.png)

**Figure 14** – a set of Keys get generated when developer create application

![Figure 14](image2.png)
• Create the Facebook client object by sending the API_KEY and SECRET_KEY
• Generate a token and send to Facebook server
• Redirect to Facebook login page and prompt user for login
• Server will generate a session for communication

```java
public static String API_KEY = "c4e61984b41e72d719dc2d09e799857a";
public static String SECRET = "90edd4518f4e964ea428f983d0ad2b41";

FacebookXmlRestClient client = new FacebookXmlRestClient(API_KEY, SECRET);

String token = client.auth_createToken();

    + API_KEY + "&v=1.0"
    + "&auth_token=" + token;

Runtime.getRuntime().exec("C:\Program Files\Internet Explorer\iexplore.exe " + url);

System.in.read();

String session = client.auth_getSession(token);
```

Figure 15 – sample java code for Facebook API access

6.4 Facebook API capability

Following is what Facebook API can and cannot do:

Can

• Access Facebook friend network data
• Facebook look and feel
• Access user profile information
• Embed media
• Mobile support
• Facebook infrastructure – feed – comment … etc
• Internationalization
• Define what can see and what cannot see by user
• build own social gaming platform that resides on one’s own website but leverages the power of users’ Facebook relationships
• site always host outside – can address from non-Facebook domain
• API access on external web site except fbml

Cannot
• Access user real email address

6.5 Drupal for Facebook

There are currently 2 versions for Drupal for Facebook, version 1 has some issue with the username with submitting comments and posting; while version 2 fixed the username problem.

Figure 16 – after installing version 2, user name problem is fixed
6.6 Drupal for Facebook Installation

Installing Drupal for Facebook requires developer to finish the following steps:

- Drupal 5.8 installed on a server machine
- Download the Facebook client API from Facebook web site
- Install Facebook-aware theme into Drupal theme directory
- Edit the settings.php to include the fb_setting.inc
- Enable the Facebook module with in the Drupal admin page
- Edit Apache config files to enable mod_rewrite for URL rewriting
- Enable Clean URLs inside Drupal admin page
- Create Facebook application within Drupal create content page and user can create a Facebook application just like create other contents

```xml
<Directory "C:/Program Files/Apache Software Foundation/Apache2.2/htdocs">
RewriteEngine on
RewriteBase /
RewriteCond %{REQUEST_FILENAME} !-f
RewriteCond %{REQUEST_FILENAME} !-d
RewriteRule ^(.*)$ index.php?q=$1 [L,OSA]
</Directory>
```

Figure 17 – rewrite rules must be specified in Apache configuration file
Figure 18 – clean URL must be enabled for Drupal for Facebook to function correctly

6.7 Drupal for Facebook Configuration

The configuration of Drupal for Facebook involves or setting correct parameters when creating a Facebook application inside the Create Content page and setting parameters for mapping Facebook users into Drupal user accounts. The user profile in Facebook will automatically get mapped into Drupal database.

Figure 19 – copy the secret Keys and info from Facebook
When user log in to Facebook, local Drupal accounts get created automatically and mapped to user’s Facebook account. According to the Drupal for Facebook configure page, there are several options for Create Local Account:

- Never
- If user has logged in
- If user has added this app

Also we can map accounts to Facebook

- Never map account
- Map account when user login
After configured Drupal site and Facebook to point to Drupal site, we can logon to our Facebook account to view the Drupal content.

When clicking on the My Account link, user can configure their Drupal account settings. User can create a text post or video post by clicking on the Create Content link. User has read only permission when not logged in to their Facebook account.

Figure 21 – User mapping and settings in Drupal for Facebook

Figure 22 – user can view Drupal content without logging in to Facebook
Suppose your Drupal site has its own membership, will the automatic account generated by Facebook allow users to access your Drupal application. The automatic account generated by Facebook will allow users to access my Drupal site also, a little think need to be done, inside Facebook, go to "My Account" > Edit then change the password to what ever password I like.

Suppose a Facebook member login to your Drupal application, what page will be displayed when he logs out of your Drupal application. It will bring user back to the Drupal site's main page, since it's same as clicking the Logout link in the Drupal site. We can also configure clicking Logout to bring user back to main page as demoed at http://apps.facebook.com/drupalforfacebook

What’s good about the automatic generated Drupal accounts for Facebook members using your Drupal application. Facebook user don't need to manually create another account for Drupal, user can see Drupal content directly.

- User can login to Facebook and add this app (an account will created automatically for 1st time user)
- User can also do posting and write comments.
  a Drupal account will get created like mailto:979073498@facebook 979073498@facebook
  but user will need to go to "My Account" > "Edit" to create a password, so that they can login to Drupal site account.
• It is doubt Facebook application have the ability to get a hold of user's Facebook password.

• In fact, none of email and password get mapped - when Drupal account get created automatically, only user need to manually enter password + email.

• Drupal ID like 699999951@facebook is randomly generated.

• Facebook application may not have the ability to gain access to user password, In fact, I tried to use my Facebook password but I won't work, unless I enter a new password.

• User can always go into "My Account" > "Edit" then change the username + password exactly the same as Facebook username / password, and then login to Drupal account.

• I believe the automatic generated account is a temp account, user can always reset the username and password.

7. FACEBOOK INTEGRATION

7.1 Integrating Facebook and Buddylist2

Buddylist2 is the only choice for Drupal 5.x, one can add other user to the buddylist like go to user's profile and click "add to buddylist".

To insert the code for linking, one should be using the function inside fbconnect.module source code file near the function of fbconnect_association_form_submit:

function fbconnect_association_form_submit($form, &$form_state)

As soon as Facebook uid is associate with Drupal uid, one can query the Facebook friends and add to buddylist.

Other possible place to insert code to integrate Facebook and buddylist2 is through corn job, a look into corn.php only has 3 lines, one can added the code in - drupal_cron_run()

include_once './includes/bootstrap.inc';
drupal_bootstrap(DRUPAL_BOOTSTRAP_FULL);
drupal_cron_run();

One can have a corn job execute every 5 or 20 min to reload all Facebook friends and add to buddylist.
Figure 24 – Facebook integration

Figure 25 – buddylist
7.2 Linking with Facebook

One have to logout Facebook and logout HD4S, Facebook keep the session, once user click the logo, it will bring user the two choices:

- Don’t have a account? Create an account now
- I already have an account, I’d like to use Facebook Connect features.

but if user logout both HD4S + FB, then it will pop up a Facebook username/password popup and prompt you to sign up Facebook account.
Figure 27 – Connect with Facebook

Figure 28 – Connect with Facebook
Figure 29 – Connect with Facebook

Figure 30 – Connect with Facebook
Figure 31 – imported Facebook information
7.3 Buddylist2 Shortest Route API

It is a Buddylist2 API that calculate shortest distance between 2 friends, for example, if friend is in this order:

- admin -> intel -> test

then the API will print the route like the following on the left side bar.

7.4 Algorithm for connecting friends

Using the Facebook API, there is function to found out if two users are direct friend or not. For instance using the following FQL query may found if two user in Facebook are friends or not:

SELECT uid1, uid2 FROM friend WHERE uid1=699999951 AND uid2=5240928

The algorithm is to build a graph of connected friends. For example, I have 5 users in HD4S is some how connected, use the Facebook API, to found out if 2 user is direct friend or not and construct the following graph:

User 1, 2, 3, 4, 5 are connected in the following way:
1-2
1-3
2-4
2-5

Draw the graph in memory, then if we need to know distance of user 1 - 5, one can follow the graph and found distance is 1 - 2 – 5, which is distance 2.

A test of The FBML doesn't not seem to work inside the Drupal page, the one FQL test with all keys in the code works which includes facebook.php.
7.5 The GMap conflict

When one install Facebook Module under HD4S and the FBConnect module did not show up, there is evidence forum said that GMap markers and bubble won't show up after install FBConnect. It has been verified that FBconnect module conflict with GMap module that GMap markers and bubble will not show up if FBconnect is enabled. Digging further and it seems the Facebook Module’s java script code:

- fbconnect.js
- featureLoader.js
are messing up the GMap JavaScript code that get calls before GMap scripts.

7.6 Calculating social distance

In a friend relationship more than friend of friend is not too useful as any, for friend distance > 3 would same as a stranger to a user. it would be useful if the review is from a friend but friend of friend and beyond (Friend distance > 3) is not much use, it means to user same as a stranger.

Immediate friends (distance 1) and friend's friend (distance 2) is in our interest here. Any friend distance above (distance 3) is useless in my opinion. One can write a loop for return

- Immediate friend
- Friend's friend

One had done test the buddylist2 module again:

- http://drupal.org/handbook/modules/buddylist2

Social Distance:

A1 – A111 = 2
A151 – A11 = 3
A1 – A13 = 1

Figure 33 – social graph
Calculate Weighted Average

For the case of
Distance = 2, 1 and 4
Rating = 4, 1 and 4

Weighted Average
= 4*(1/2) + 1 * 1 + 4*(1/4) / (1/2+1 + 1/4)
= 4 / (7/4)
= 16/7
= 2.3

Figure 34 – social distance calculation

Figure 35 – weighted average
7.7 Friend Detection

In order to get friends is limited only to currently logged in user's immediate friends.

Looking through FQL or Facebook API, there are function to found out if the user are direct friend or not by the following query

- SELECT uid1, uid2 FROM friend WHERE uid1=699999951 AND uid2=5240928

There is only three functions in the API to get friends, and the friend list is only for logged in user's friend list, that means we cannot give any two user and get all their friends.

- <facebook.friends.areFriends> Which is the API call to found how if a pair of user id are actually friends or not.
- <facebook.friends.get> Which returns the ids of the logged in user’s friends list.
- <facebook.friends.getAppUsers> Which return the ids of the logged in user’s friends who is also currently logged into the Facebook website.

There is another very good module call "Friend" module but it only works for Drupal 6.
Instead of using both Facebook and buddylist2, one can also force users to use Facebook if they want any friends connected. It may become too messy to keep two separate social graphs combined, Facebook and buddylist2, so users can either do not want to social, or they sign up Facebook and connect to Facebook if they want to connect to any friends.

![Facebook Test Console](image-url)

Figure 37 – Facebook Test Console
Figure 38 – shortest route in social graph

Figure 39 – the route of friends
8. COLLABORATIVE FILTERING

8.1 Embedded Media Field Module

This is a module that lets user to embed video content in their web sites.

![Figure 40](image)

Figure 40 – instead of submitting the video URL, user can manually enter code

8.2 Video Module

This module allows users to submit videos to a Drupal site. Also Video module has the capability to view video online or download the video to local machine.

![Figure 41](image)

Figure 41 – video module demo site
8.3 Video issue on Facebook API

In order to embed video in a web page, developer needs to use the `<embed>` tag or `<object>` tag, but Facebook disallow the use of those tag, instead, Facebook needs to use their own custom tag `<fb:swf>` to post flash video content. A work around is to post both tag twice in order for user to see the video content in both Drupal and Facebook web site. Furthermore, in order to submit FBML, user must use the PHP code input format.

```
<fb:swf swfbgcolor="000000" imgstyle="border-width:3px; border-color:white;"
swfsrc="http://www.youtube.com/v/ar-5UkeF3s08hi"
imgsrc="http://www.oniva.com/upload/1356/sky.gif"
width='340' height='270' />

<embed
src="http://www.youtube.com/v/ar-5UkeF3s08hi"
type="application/x-shockwave-flash" allowfullscreen="true" width="425"
height="344"></embed>
```

Figure 42 – one way to fix the video tag problem is to enter tag twice

8.4 Recommendation System

To setup the Recommendation System, one needs to Install buddylist2 and test the database table on how to relate Facebook Connect table with buddylist2 users.

Given two HD4S users, the algorithm of finding how trustful of two users by finding social distance between them. What if the two user is not connect through any friend, that means it's distance zero trustfulness.

Any user in HD4S can rating any other users, if two users is not connected at all through any friends, then the rating will have zero effect on a user.

The recommendation system will recommend one’s friend or friend's friend who has high rating and offering help. Then recommendation system recommends volunteers to seniors who's friend or friend's friends got high rating. The rating would be how helpfulness a volunteer is to expects.
8.5 Similarity rating

By calculating how similar two users are given by the Pearson correlation formula below.

\[
sim(c, p) = \frac{\sum_{i=1}^{I} (r_{c,i} - \bar{r}_c)(r_{p,i} - \bar{r}_p)}{\sqrt{\sum_{i=1}^{I} (r_{c,i} - \bar{r}_c)^2 \cdot \sum_{i=1}^{I} (r_{p,i} - \bar{r}_p)^2}}
\]  \hspace{1cm} (1.1)

Where the variable are explained in the following:
- \( r_c \) is the average of the user c's ratings to items
- \( r_{c,i} \) is user c's rating to item i
- \( r_p \) is the average rating of user p
- \( r_{p,i} \) is user p's rating to item i
- I is items where both user c and p give ratings to

![User Name | Sim(c,p)]
<table>
<thead>
<tr>
<th>User Name</th>
<th>Sim(c,p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E131</td>
<td>1</td>
</tr>
<tr>
<td>A12</td>
<td>0.99</td>
</tr>
<tr>
<td>D135</td>
<td>0.99</td>
</tr>
<tr>
<td>A151</td>
<td>0.7</td>
</tr>
<tr>
<td>F135</td>
<td>0.65</td>
</tr>
<tr>
<td>F122</td>
<td>0.6</td>
</tr>
<tr>
<td>F123</td>
<td>0.58</td>
</tr>
<tr>
<td>E143</td>
<td>0.57</td>
</tr>
<tr>
<td>B112</td>
<td>0.56</td>
</tr>
<tr>
<td>A132</td>
<td>0.56</td>
</tr>
<tr>
<td>B155</td>
<td>0.55</td>
</tr>
<tr>
<td>A112</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Figure 43 – user similarity
<table>
<thead>
<tr>
<th>User ID</th>
<th>User Name</th>
<th>Sim(c,p)</th>
<th>Video ID</th>
<th>Your Rating</th>
<th>User Rating</th>
<th>You Avg</th>
<th>User Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>384</td>
<td>F134</td>
<td>0.02</td>
<td>1010</td>
<td>5</td>
<td>5</td>
<td>4.57</td>
<td>4.52</td>
</tr>
<tr>
<td>384</td>
<td>F134</td>
<td>0.02</td>
<td>1012</td>
<td>5</td>
<td>4</td>
<td>4.57</td>
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<td>1025</td>
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<td>5</td>
<td>4.57</td>
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<td>4.57</td>
<td>4.5</td>
</tr>
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</table>

Figure 44 - intermediate results
8.6 Find sim(c,p) members

By using the formula (1.1), and substitute all values into the formula, we will come up with a
value of -1 to 1. If the value is close to 1 that means very similar, if the value is close to -1 then
that means it is very not similar.

8.7 Video recommendation

In order to recommend item, we need to found the predicted value of an item, the following is the
Resnick formula we used for item predicted rating. After calculated all items predicated rating,
we rank them and give the top items as recommendation items.

\[
P_{c,i} = r_c + \frac{\sum_{p \in M} sim(c, p)(r_{p,i} - \overline{r_p})}{\sum_{p \in M} |sim(c, p)|}
\]

(1.2)

<table>
<thead>
<tr>
<th>Video ID</th>
<th>P(c,i)</th>
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<td>1053</td>
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</tbody>
</table>

Figure 45 – predicted video rating
9. MOBILE API

9.1 Support for Mobile Devices

Following modules support mobile devices includes
  • mobile
  • mobile theme
  • browscap

It seems that the combo of browscap and mobile theme will detect my old palm web browser, but on opera mini, it will go to the theme switching site and then switch between mobile of normal theme for some reason.

9.2 Mobile devices and JavaScript

Almost all mobile browser do not support JavaScript, That means we may want to cut the GMap feature on mobile phone.
The accessibility module will do the device detection and theme switching

- http://drupal.org/project/accessibility

One can installed the module but it has some problem with XHTML not well formed.

Figure 47 – Mobile version of a Drupal site

10. MULTIPLE MEMBERSHIP

According to HD4S profile.xls, expert organization should show:

- first name
- middle name
• last name
• gender

But expert organization did not have gender field, an organization should have a first name and last name either. That's why one show expert organization only a company name.

For volunteer, It did not show the Profile, Skills, Interests and Hobbies, because the volunteers are from old membership data where does not contain those fields. One can create some new volunteers tomorrow and generate some Profile, Skills, Interests and Hobbies data fields to show. Also the Profile field does not exist for any user type and is a mistake in the HD4S_Profile.XLS.

![Figure 48 – Multiple Membership](image)

### 11. CONCLUSION AND SUMMARY OF FEATURES

The challenge part of the implementation is the Facebook integration. We need to extend he Facebook Connect module to fit our needs as some feature requested seem not exist in the module. We also need to fix the Facebook Connect module and GMap module conflict which is a known problem, following summaries the features of HD4S:

- Allow cell phone users to access Website from their cell phones, design mobile theme with abbreviated content and images, use the Drupal Mobile Module.
• Design APIs for each selected cell phone, for different mobile browser too such as safari, pocket IE, opera.
• Create social networking infrastructure among members. Those with common review and interest profiles can be socially connected. (Or define a metric for connecting them socially), use FQL to query users with similar interests and make suggest once user log in
• Display relevant content and activities based on member’s social networking profile and how his or her socially connected friends have done (or are interested), show which of your Facebook friend has recently joined HD4S and update in your HD4S account.
• Integrate Facebook resource to enrich the website. Promote membership and publicity of your website with Facebook APIs, in HD4S web site, user can invite Facebook friends to join HD4S
• Lower security and fraud risk by applying social network to the website. Help seeker can choose a volunteer that his / her friends knows by looking into his friends list.
12. REFERENCES


Thanks For Reading