Ketan S. Palshikar. Representation of Collaborative Search Results Using Faceted Search. A Master's paper for the M.S. in I.S. degree. December, 2010. 71 pages. Advisor: Robert Capra.

This paper describes the design and implementation of a web-based, faceted interface for searching and displaying web pages saved from collaborative information seeking using the Results Space framework. Results Space project is part of Interaction Design Lab at the School of Information and Library Science at the University of North Carolina at Chapel Hill. The Results Space project focuses on managing search results across multiple sessions and multiple collaborators. This paper describes the implementation of the web-interface that enables presentation of these collaborative results using faceted search.

Once a user has worked on any collaborative project she needs to view and interact with the results. An ability to view the results across multiple facets like projects, collaborators and sources provides the user with a better depiction of the search efforts. This functionality can be further enhanced using different representations in which the user can view the search results. This paper discusses the process of developing a web application that provides such faceted search interface and representation of the search results using timeline and table view.

Headings:

Results Space

Collaborative search

Faceted Search

Graphical representation

Timeline View

REPRESENTATION OF COLLABORATIVE SEARCH RESULTS USING FACETED SEARCH

by
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Approved by

Robert Capra

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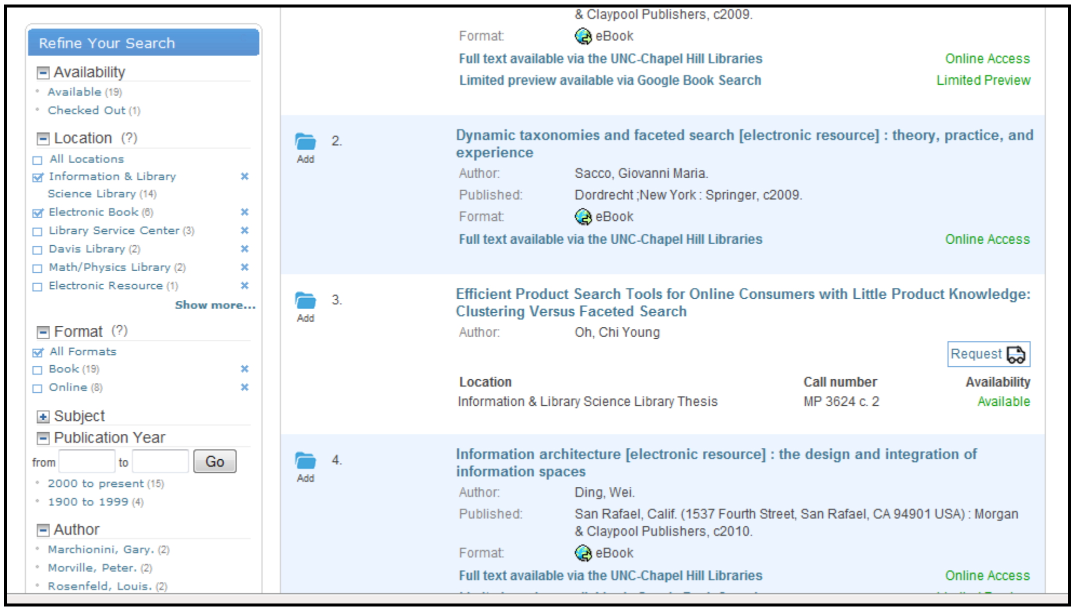
1. Introduction

This project, Representation of Collaborative Search Results Using Faceted Search, is focused on designing and implementing a faceted search interface to an existing set of collaborative search results saved using the Results Space framework and allowing a user to search and view multiple representations of the results. Collaborative information seeking provides new dimensions for information search over the Web and enables new opportunities for information seekers. The information collected from a collaborative search needs to be stored and revisited later to make it useful for all the collaborators involved. Results Space initiative aims at investigating such collaborative efforts of information seeking. This project attempts to further the capability of the collaborative information seekers by providing them with a faceted search interface and representing the results in a tabular as well as graphical mode.

Faceted search is a method for searching the information by filtering it effectively. La Barre defines Facets as “the categories, properties, attributes, characteristics, relations, functions or concepts that are central to the set of documents or entities being organized and which are of particular interest to the user group” (2007, p.82). As Tunkelang describes, faceted navigation guides the user through the collection that is being considered (2009). Instead of asking the user to express her search query in the form of text, faceted navigation lets the user progressively develop the query by having her select a value (or a set of values) from one facet and by showing the effect of that selection on the other facets. Such faceted search or faceted browsing is popular among many e-commerce companies as it can navigate users through the products very effectively. A few examples that implement faceted search are:

- fancast - http://www.fancast.com/movies
- google shopping - http://www.google.com/products?hl=en&q=ipad&um=1&ie=UTF-8&sa=N&tab=wf
- bluenile - http://www.bluenile.com/diamond-search?filter_id=0&track=head
- at&t - http://www.wireless.att.com/cell-phone-service/cell-phones/cell-phones.jsp?wtSlotClick=1-003ZVV-0-1&WT.svl=graphic

Though faceted search proves efficient in general, its application to a complex system like a library catalog may need further investigation (Fagan, 2010). In spite of this, many libraries have started increasingly relying on the faceted browsing. A typical faceted search interface for a library system is shown below:



Refine Your Search

Availability
- Available (19)
- Checked Out (1)

Location (?)
- All Locations
- Information & Library Science Library (14)
- Electronic Book (6)
- Library Service Center (3)
- Davis Library (2)
- Math/Physics Library (2)
- Electronic Resource (1)

Show more...

Format (?)
- All Formats
- Book (19)
- Online (8)

Subject

Publication Year

from to Go
- 2000 to present (15)
- 1900 to 1999 (4)

Author
- Marchionini, Gary. (2)
- Morville, Peter. (2)
- Rosenfeld, Louis. (2)

& Claypool Publishers, c2009.
Format: eBook
Full text available via the UNC-Chapel Hill Libraries — Online Access
Limited preview available via Google Book Search — Limited Preview

2. Dynamic taxonomies and faceted search [electronic resource] : theory, practice, and experience
Author: Sacco, Giovanni Maria.
Published: Dordrecht ;New York : Springer, c2009.
Format: eBook
Full text available via the UNC-Chapel Hill Libraries — Online Access

3. Efficient Product Search Tools for Online Consumers with Little Product Knowledge: Clustering Versus Faceted Search
Author: Oh, Chi Young
Request

Location	Call number	Availability
Information & Library Science Library Thesis	MP 3624 c. 2	Available

4. Information architecture [electronic resource] : the design and integration of information spaces
Author: Ding, Wei.
Published: San Rafael, Calif. (1537 Fourth Street, San Rafael, CA 94901 USA) : Morgan & Claypool Publishers, c2010.
Format: eBook
Full text available via the UNC-Chapel Hill Libraries — Online Access

Figure 1: Faceted Search Example – UNC Libraries

A faceted browsing enabled on the library website of the UNC-Chapel Hill lets the user refine her search by letting her choose a set of particular libraries where the book is available or the format of the book or by letting the user put the publication year range. Change in each of these facet values make the other facets to get updated thus navigating the users though the collection more effectively.

In this project, I designed and built a faceted search interface to display results of collaborative searches. The interface includes three main facets: a. **Projects** – the projects on which the user has worked, b. **Collaborators** – the collaborators with whom the user has worked and, c. **Sources** – the web sources which the user has used. Selection of one or more values from the facets updates the facets and generates a set of results which can be either displayed as a table or displayed on a time-line graph.

2. Results Space project

Results Space project is an initiative of the Interaction Design Lab at the School of Information and Library Science. This project investigates how users collaboratively search, manage, and synthesize information found from the web searches. Because the information is sought and collected collaboratively, the task of sense-making of this information has new dimensions. Results Space focuses on this results management over multiple search sessions and with multiple collaborators. To investigate such multi-session collaborative information seeking, Results Space project provides the *Coagmento* framework. This framework enables the users to easily collect the information over the Web and communicate this information with the collaborators. Coagmento lets the user to share, re-find and reuse the information thus supporting the task of sense-making of the collaborative information more effective (Shah, 2010). To achieve this goal *Coagmento* allows users to create various **projects** under which various searches can be performed and results stored. It also lets the users to invite other users to work on these projects. Thus *Coagmento* successfully builds an environment for collaborative information seeking. Searches performed and the results obtained are stored in the database thus preserving multiple sessions of the users.

After achieving a framework that enables multi-session collaborative information seeking, it is required to provide an interface to facilitate effective management of the information. It is also necessary to represent the search results in such a way that will help examining and interpreting these results. This project attempts to achieve these two objectives: 1) searching through the results using different filters and, 2) providing different representations of the results (e.g. tabular and graphical). To search through the results the project uses faceted browsing. As the *Coagmento* framework enables each search to fall under a particular **project,** the first and the most important facet in the faceted search is **project.** As the Results Space project aims at studying collaborative information seeking, the second facet in the faceted search is **collaborators**. To further narrow down the results, the third facet provided is **source** (e.g. the website where the information was found). Using these three facets a user can filter the results. A set of results after putting the filters can be displayed in two views: List View and Graph View. List View displays the results in the tabular form while Graph View attempts to capture the multiple sessions from which the results are obtained and plots a graph of results versus the sessions when those results are retrieved.

3. Use Cases

3.1 Use Case 1 – filters on Project(s) and Collaborator(s)

Mark, Chung and Sindhu are planning a trip to India. They have decided to use *Coagmento* to make their searches for gathering the information for the trip. They have created three projects on *Coagmento* for this trip: Travelling in India, Flights to India, and Hotels in India. For all these projects each of them have searched and now Mark, who is expected to plan the outline of the trip, has logged into *Coagmento* and wants to find the most useful searches for each project. For reviewing all the searches and information found, Mark can use the interface that is the topic of this project. As Mark, Chung and Sindhu have worked on these projects collaboratively, Mark can see all the three projects in his **Projects** facet. At the same time he can see all his other projects which are not necessarily collaborated with Chung and Sindhu. Similarly, he can see Chung and Sindhu in his **Collaborators** facet along with other collaborators who are not related to his India Trip projects. He can filter the results by selecting any of the projects and any of the collaborators. While working on the project "Travelling in India", Mark trusts Sindhu's search results more as she is from India. Thus he selects the project "Travelling to India". Once he selected this project all the collaborators who have not contributed to this project disappear from the collaborators facet. He can thus see only Sindhu and Chung in the collaborator facet and he selects "Sindhu". This way he will be able to see only those results retrieved by Sindhu. However, for finding the flights to India and finding the hotels in India, Mark believes that both Sindhu and Chung are good at finding good flights and hotels. Thus he decides to see the results for these two projects together. To do this, Mark can select both projects “Flights to India” and “Hotels in India” and select both collaborators “Chung” and “Sindhu”. He will then be able to retrieve the results retrieved by Chung for the projects “Flights to India” and “Hotels in India” along with the results retrieved by Sindhu for the same projects.

3.2 Use case 2 – filters on Project(s) and Source(s)

Dr. D’Souza is a professor of political science at Goa University, India who is planning to organize a conference on “Effects of Globalization on Democracy”. For gathering the information on the subject and preparing the topics for the conference, Dr. D’Souza has decided to use *Coagmento* and has created projects as “Democracy in Developing Countries”, “Democracy in Developed Countries” and “History of Globalization”. During last few months she has gathered enough information and now she wants to browse through the results to finalize the topics for the conference. Thus she logs into *Coagmento* and sees the above mentioned projects displayed under the facet Project. She has used various sources while searching the information on these projects. The sources she has visited include “Wikipedia”, “unc”, “uchicago” and “jnu”. She remembers that she has got some useful information about democracy using the source “uchicago”. Thus she selects projects “Democracy in Developed Countries” and “Democracy in Developing Countries” and selects the source “uchicago” to find the result. Also she knows that the source “unc” has some useful information on globalization. Thus she selects project “History of Globalization” and selects source “unc” to see the results and find the useful ones from them. Before selecting projects

“Democracy in Developed Countries” and “Democracy in Developing Countries”, Dr. D’Souza can see number of other sources which are not related with her searches about the conference. However when she selects these projects, the source facet gets updated to show only those sources that are related to them.

3.3 Use Case 3 – filters on source(s) and collaborator(s)

Astrophysicist Dr. Narlikar is studying the Venus Transit that is going to occur on 5th June 2012. As a part of this study he has decided to collaborate with two other astrophysicists, Dr. Lightman and Dr. Ni. Each of them has gathered various information using different sources. They have divided this information into different projects like “Planet Transits”, “Venus”, and “Occultation”. The sources used by all of them include “Wikipedia”, “NASA”, and “TransitOfVenus”. Now, when Dr. Narlikar wants to revisit the information collected, the projects under which this information is categorized are not important to him. Thus he chooses to select collaborators as himself and Dr. Lightman. Once he selects these collaborators, the projects and sources facets get updated to show only the projects on which Dr. Narlikar and Dr. Lightman have worked together and the sources each of them have used for those projects. Dr. Narlikar then selects sources “NASA” and “TransitOfVenus” to view the results obtained by him and by Dr. Lightman using the selected sources.

4. Backend Details

To make the results of the searches made over multiple sessions available it is required to store these results. The results are thus stored in a relational database. Results Space projects (e.g. Coagmento) use a MySQL database for this purpose. The Entity-Relationship diagram in Figure 2 depicts some of the important entities in the database along with their relationship with each other.

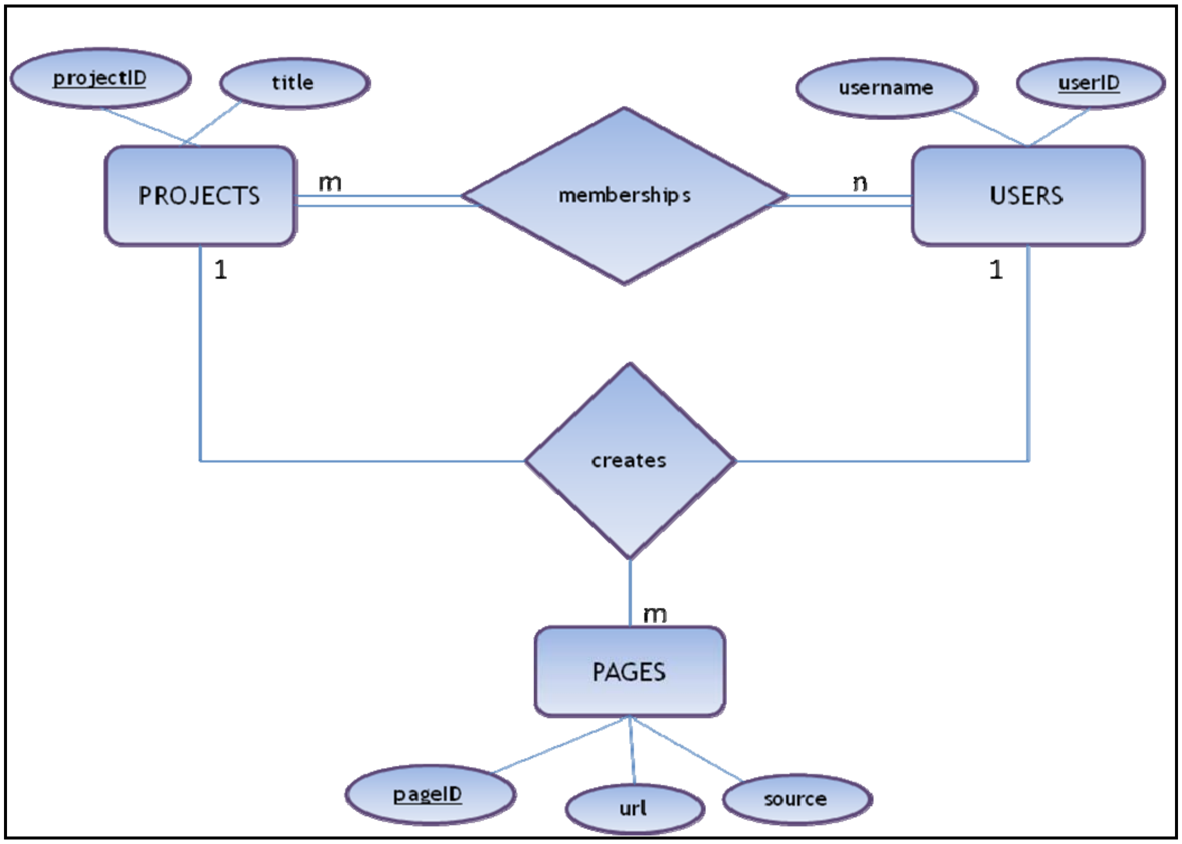


Figure 2: Partial Entity-Relationship diagram representing the key entities, attributes and relationships

Features of the ER Diagram:

1. Table PAGES is formed from the actual results of the searches. PROJECTS table lists all the projects created on *Coagmento* and USERS table has all the users registered on *Coagmento*.

2. Every result from the PAGES table is associated with a single project and is created by a single user, thus creating a ternary relationship between the project, the collaborator and the pages.

3. Each project can have one or more users associated with it and each user can be involved with one or more projects. This kind of many-to-many relationship necessitates creation of a relationship table for the relationship “memberships”. Thus the table MEMBERSHIPS has IDs of projects and users which indicates the projects and the collaborators (users) working on those projects.

Sample queries:

To update the facets and the results, SQL queries can be performed on the database design described above. Below are some examples of queries that are performed to update the faceted search interface.

1. Display all the projects for the logged in user “mark” (userID = 1).

```
SELECT projects.title
FROM projects, memberships
WHERE memberships.projectid=projects.projectid AND memberships.userid=1
GROUP BY projects.title
```

2. Logged in user “mark” wants to see all the collaborators for the projects “Flights to India” (projectID = 2) and “Travel in India” (projectID = 1).

```
SELECT DISTINCT username
FROM memberships, users
WHERE users.userid=memberships.userid
        AND (memberships.projectid=1 OR memberships.projectid=2)
```

3. Logged is user “mark” wants to see the results for the source “Wikipedia” for all his projects (projectIDs 1, 2, and 3)

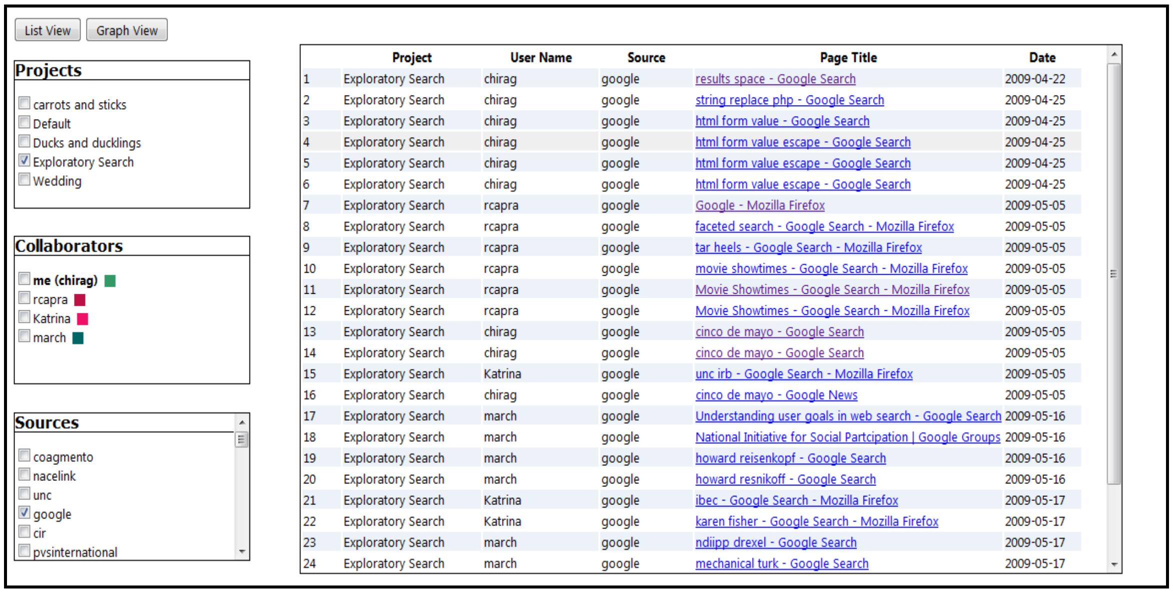
```
SELECT pages.date, projects.title prTitle, users.username, pages.source, pages.url
FROM projects, users, pages
WHERE pages.userid=users.userid AND pages.projectid=projects.projectid
        AND (pages.source = 'wikipedia')  AND
        ( projects.projectid=1 OR projects.projectid=2 OR projects.projectid=3)
```

As the sample query (3) shows, a query can be built to filter the values within the facet as well as across the facets. While building such queries an SQL operator AND is used to filter the results across two facets but an operator OR is used to filter the values within the same facets. Thus, when the query (3) is translated to English language it can be expressed as:

“find date, project title, username, page source and page url from the tables projects, users and pages by joining them to each other and filtering the page source for the value ‘wikipedia’ AND filtering the projectid for values 1 OR 2 OR 3.”

5. Faceted Search Interface – Overview

This project builds a web application for faceted search that enables each facet to be updated by the changes in one facet as well as updating the results according to the selected facets. The faceted search interface is shown below:



	Project	User Name	Source	Page Title	Date
1	Exploratory Search	chirag	google	results space - Google Search	2009-04-22
2	Exploratory Search	chirag	google	string replace php - Google Search	2009-04-25
3	Exploratory Search	chirag	google	html form value - Google Search	2009-04-25
4	Exploratory Search	chirag	google	html form value escape - Google Search	2009-04-25
5	Exploratory Search	chirag	google	html form value escape - Google Search	2009-04-25
6	Exploratory Search	chirag	google	html form value escape - Google Search	2009-04-25
7	Exploratory Search	rcapra	google	Google - Mozilla Firefox	2009-05-05
8	Exploratory Search	rcapra	google	faceted search - Google Search - Mozilla Firefox	2009-05-05
9	Exploratory Search	rcapra	google	tar heels - Google Search - Mozilla Firefox	2009-05-05
10	Exploratory Search	rcapra	google	movie showtimes - Google Search - Mozilla Firefox	2009-05-05
11	Exploratory Search	rcapra	google	Movie Showtimes - Google Search - Mozilla Firefox	2009-05-05
12	Exploratory Search	rcapra	google	Movie Showtimes - Google Search - Mozilla Firefox	2009-05-05
13	Exploratory Search	chirag	google	cinco de mayo - Google Search	2009-05-05
14	Exploratory Search	chirag	google	cinco de mayo - Google Search	2009-05-05
15	Exploratory Search	Katrina	google	unc irb - Google Search - Mozilla Firefox	2009-05-05
16	Exploratory Search	chirag	google	cinco de mayo - Google News	2009-05-05
17	Exploratory Search	march	google	Understanding user goals in web search - Google Search	2009-05-16
18	Exploratory Search	march	google	National Initiative for Social Partcipation | Google Groups	2009-05-16
19	Exploratory Search	march	google	howard reisenkopf - Google Search	2009-05-16
20	Exploratory Search	march	google	howard resnikoff - Google Search	2009-05-16
21	Exploratory Search	Katrina	google	ibec - Google Search - Mozilla Firefox	2009-05-17
22	Exploratory Search	Katrina	google	karen fisher - Google Search - Mozilla Firefox	2009-05-17
23	Exploratory Search	march	google	ndiipp drexel - Google Search	2009-05-17
24	Exploratory Search	march	google	mechanical turk - Google Search	2009-05-17

Figure 3: Faceted Search Interface – List View

The left panel contains the facets **Projects**, **Collaborators** and **Sources**. This panel also provides buttons to switch to the **Graph View** and the **List View**. Each facet displays the results of that facet for the logged in user and the checkbox enables the user to select a particular value from the facet. For example, in the above depiction, the project *Exploratory Search* is selected as well as the source *google* is selected. The projects associated with the logged in user with the source as *google* are *carrots and sticks*, *Default, Ducks and Ducklings, Exploratory Search* and *Wedding*. Similarly, collaborators for the project *Exploratory Search* and the source *google* are *rcapra, Katrina and march*. The logged in user always appears as one of the collaborators so as to find the search results collected only by the logged in user. This logged in user appears in the list of collaborators as *me*. The sources for the selected project *Exploratory Search* are listed in the source facet. As Figure 3 shows, among the list of the sources, the source *google* is checked to display only the results collected using the source *google*. This front-end of the web based interface functions by interacting with the MySQL database in which the data of the search results reside. The connection to the database and fetching and displaying the results is achieved using server-side scripting language, PHP. Along with the JQuery framework, AJAX is used to partially refresh the page instead of refreshing the complete page each time when the combination of the selected facets is changed. Thus four AJAX calls are implemented – one for each facet panel and one for the results panel. Each facet panel as well as the results panel is refreshed asynchronously. Use of AJAX has also enabled segregation of the code that controls each facet panel and the results panel which can be described by the activity diagram shown in Figure 4:

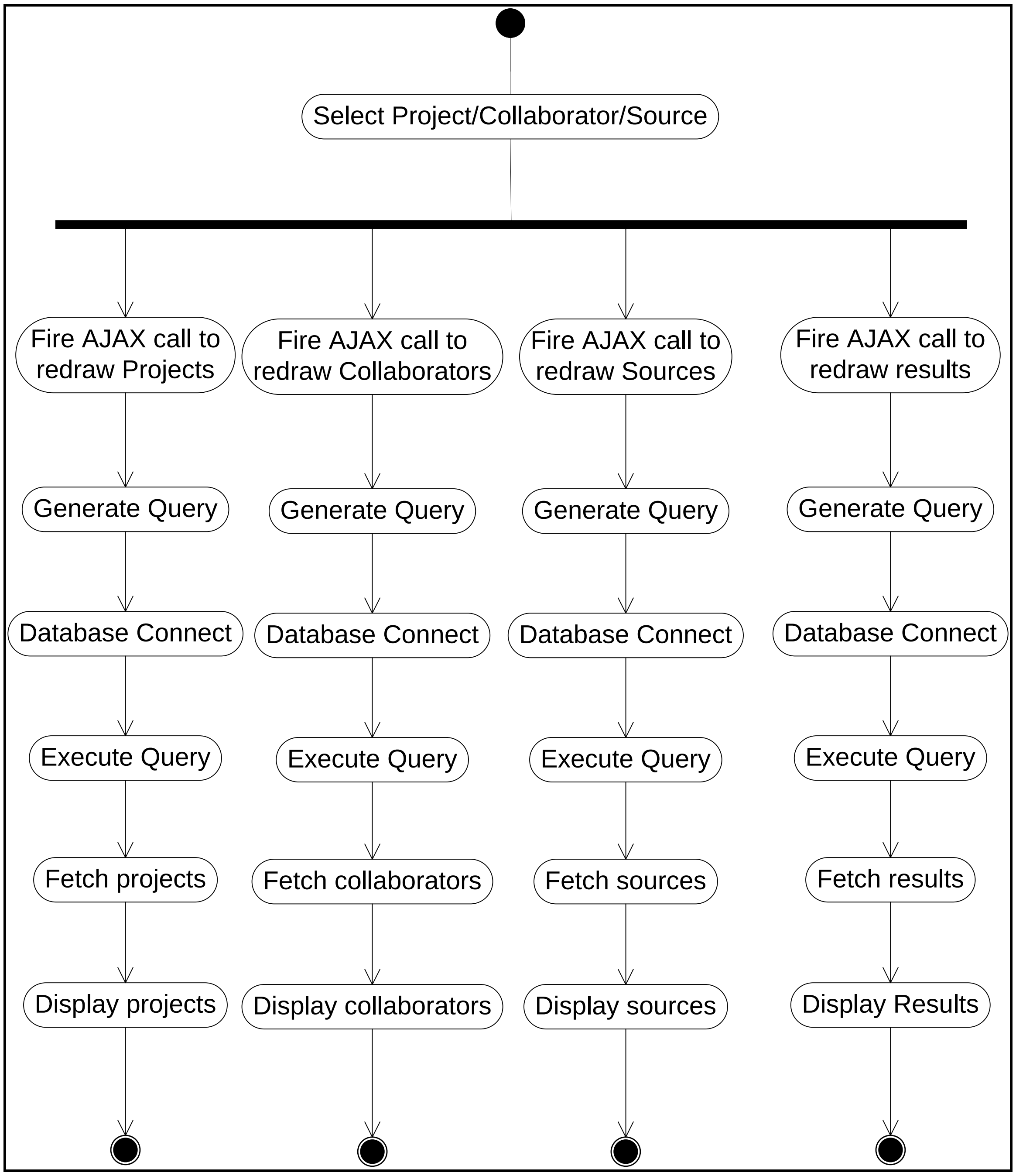

Select Project/Collaborator/Source
Fire AJAX call to redraw Projects
Fire AJAX call to redraw Collaborators
Fire AJAX call to redraw Sources
Fire AJAX call to redraw results
Generate Query
Database Connect
Execute Query
Fetch projects
Fetch collaborators
Fetch sources
Fetch results
Display projects
Display collaborators
Display sources
Display Results

Figure 4: Activity Diagram to update facets and results asynchronously

As the activity diagram depicts, when the user clicks a facet value in any of the facet panels (e.g. selecting a specific project to filter the results), this causes four different independent processing activities to start: refresh project panel, refresh collaborator panel, refresh source panel, and refresh results panel. Each of these processing activities are independent of each other and do not wait for the other activities to complete. Each thread of activity involves generating a query according to the selection made by the user, making a connection to the database, executing the generated query in the MySQL database, fetching the results from the database to the web front-end and using the results of the query to update the associated panel once the AJAX call is successfully completed.

6. Implementation Details

As the interface is implemented using AJAX, the whole page does not get reloaded when user interface elements are clicked and the user is not navigated away from the main page. Instead, the processes described above update the panels on the page. A block diagram of the implementation schema of the project is shown in Figure 5:

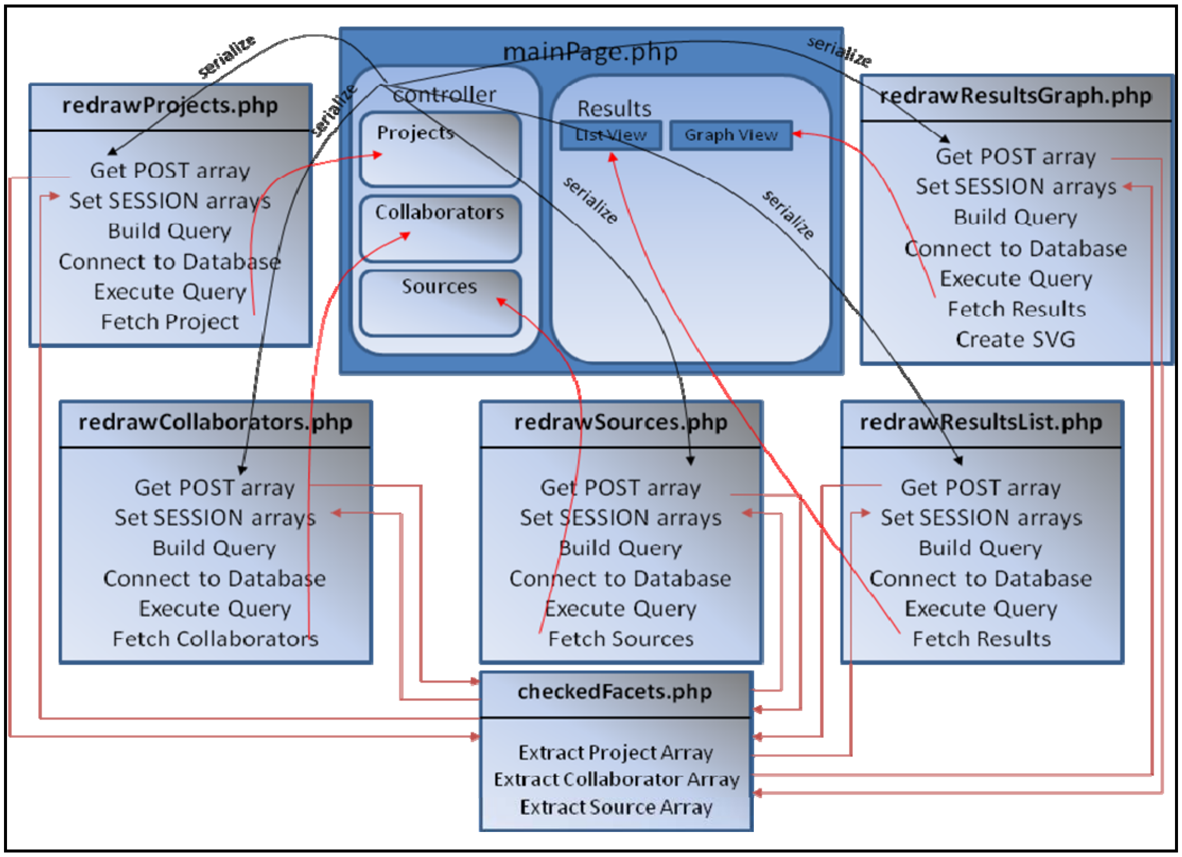


Figure 5: Block diagram of the implementation details

Once the user is logged in, *mainPage.php* page gets loaded. This page contains three separate panels on its left which together act as a controller that calls php pages, which in turn, load the facet information in the facets and the results in the results section of the page. This is achieved using AJAX calls which get fired by the *onload* event when the body of mainPage.php gets loaded. The Code Segment 1 depicts the basic structure of the main page that loads all the facets and the results. The elements <p> with ids “projects”, “collaborators”, “sources” and “results” are used to load the facets and results.

```
<form method="POST" id="controller">
     <input type="hidden" name="username" value=<?php echo
$username ?> />
     <div class="bucket top scrollable box"><div
class="facetHeading smallBox" id="projectsDiv">Projects</div>
          <p id="projects"> </p>
     </div>
     <div class="bucket center scrollable box"><div
class="facetHeading smallBox"
id="collaboratorsDiv">Collaborators</div>
          <p id="collaborators"> </p>
      </div>
     <div class="bucket bottom scrollable box"><div
class="facetHeading smallBox" id="sourcesDiv">Sources</div>
          <p id="sources"> </p>
     </div>
     <p><input type="button" id="list" value="List View"
onClick="fnListView()"/>
          <input type="button" id="graph" value="Graph View"
onClick="fnGraphView()"/>
     </p>
     <p class="scrollable mainView box" id="results"
style="width:70%"></p>
     <p class="scrollable mainView" id="resultsGraph"
style="display:none">
          <iframe
src="http://idl63.ils.unc.edu/ketan/revised/new/final/<?php echo
$username.'.svg'; ?>" height="450" id="iframe">
          </iframe>
     </p>
</form>
```

Code Segment 1: HTML frame of the main page

The <p> elements are empty in the above snippet because they get filled up with the facets and results when AJAX call is fired and completed. As mentioned before, AJAX is implemented using jQuery which is a cross-browser JavaScript library. The Code Segment 2 below shows the four identical AJAX calls which serialize the data obtained from the <form> with id "controller" and sends it to the correct php file. The serialization() function of jQuery is used to get ALL the user entered data and to send it to the php file. This php file returns the results which are loaded in the elements with the ids "projects", "collaborators", "sources" and "results" respectively.

```
$.post(
      "redrawProjects.php",
       $("#controller").serialize(),
      function(data){
           $("#projects").html(data);
           document.getElementById("projectsDiv").innerHTML =
"Projects";
      }
);
$.post(
      "redrawCollaborators.php",
      $("#controller").serialize(),
      function(data){
           $("#collaborators").html(data);
           document.getElementById("collaboratorsDiv").innerHTML
= "Collaborators";
     }
);
$.post(
      "redrawSources.php",
      $("#controller").serialize(),
      function(data){
          $("#sources").html(data);
          document.getElementById("sourcesDiv").innerHTML =
"Sources";
     }
);
$.post(
      "redrawResultsList.php",
      $("#controller").serialize(),
      function(data){
            $("#results").html(data);
      }
);
```

Code Segment 2: AJAX calls using jQuery

$.post is a higher level abstraction of $.ajax method which uses HTTP POST request to exchange the data with the server and unlike $.ajax, it allows only one callback function that will be executed when the request is completed and the response has a successful response code.

This $.post function has three parameters. The first parameter is the URL of the page to load. This function loads *redrawProjects.php* page which will generate and execute the SQL query to fetch list of projects.

Second parameter is the data to be sent to the server. This can be a key-value pair if a single value is to be sent to the server. However in our case, we use it to send ALL the selected values of ALL the facets along with information identifying the logged in user. This is achieved by creating an html *form* element with id as *controller* and loading all the facets inside this form element. When user selects any value from any facet, an *onClick* event is fired which invokes a JavaScript function containing all the $.post methods, each loading a php page for one facet and one for the results area. As the form is submitted it needs to send all the selected values of the facets and the username to the php page. This can be done by using .*serialize()* method to send the ALL the data fields of the form to the server. Serialization creates a text string in the form of key1=value1&key2=value2&key3=value3 which then can be sent to the server.

Third parameter in $.post method is the anonymous function which is executed when the request is complete and the response is successful. The response obtained from *redrawProjects.php* is stored in a variable *data* and this response replaces the contents of the element with id *projects*.

Thus mainPage.php fires five $.post methods, three to update the facets – Projects, Collaborators and Sources – and two to update the results in List View and Graph View. Each $.post method calls a different php page as shown in the block diagram. This approach of separating control of each facet improves the maintainability of the code and helps adding or removing of the facets in the future. Although this structure does not confirm with the conventional MVC architecture, this structure offers many of the advantages of the MVC structure.

As Figure 5 shows, each php page which is called from the main page further calls another php page 'checkedFacets.php'. This intermediate page is implemented to create three separate arrays; one containing all the selected projects, one containing all the selected collaborators and one containing all the selected sources. The page checkedFacets.php contains three different functions each one extracting the list of selected values from the facets Projects, Collaborators and Sources. As mentioned above, $.post sends all the selected values to the server using *.serialize()* method. Thus the array $_POST looks like this:

```
Array([username] => loggedInUserName [proj0] => 1 [collab1] => 6
[collab2] => 7 [collab3] => 8 [source0] => coagmento [source2] =>
unc [source4] => google)
```

These values in the array are to be used to build the SQL query to find the values of the facet. Thus it is necessary to separate the values of projects, collaborators, sources and the logged in user to build the query with the correct input. Each function in the page checkedFacets.php receives this $_POST array as an input parameter and depending on the key of the array it separates this single array into three different arrays: projArray, collabArray and sourceArray. redrawProjects.php then stores these arrays into the session variables: $_SESSION['qproj'], $_SESSION['qcollab'] and $_SESSION['qsource']. These session variables then can be used across the session in all the pages just by starting the session.

```
function extractCheckedProjects($postProj)
{
     $j=0;
     /* -- Runs the loop to store current element in the array
into $current variable -- */
     while($current = current($postProj))
     {
          /* -- Stores the key of the array into the variable
$key -- */
          $key = key($postProj);
          /* -- stores the current element of the array into an
array $projArray when the key of the array has word 'proj' -- */
          if (strstr($key,'proj') != false)
               $projArray[$j++] = $current;
          next($postProj);
     }
     return $projArray;
}
```

Code Segment 3: Extracting the selected facets

Code Segment 3 extracts the array for the selected project when the input array of $_POST is passed to it. Similarly functions *extractCheckedCollaborators($array)* and *extractCheckedSources($array)* extract and return the arrays of selected collaborators and sources respectively. These arrays then are used to build the SQL queries to fetch the values of the facets from the database.

6.1 Implementation of Facets

The Coagmento framework, which collects the data of the collaborative searches and stores it in the database, has *Projects* as a key unit. As the user works on a particular project while using Coagmento, her results, sources for that result, collaborators related with that work are linked to the project. For example, when user Sindhu is logged in and wants see all the sources for her collaborative work with another user Mark, the query that needs to be submitted to the database will be: “Find all the sources for the user Sindhu and user Mark **for the projects** on which they have worked together.” Thus the easiest way to retrieve the list of all the sources is to get the displayed list of projects after selecting the user Mark as the collaborator and build a query for the sources with those projects. This approach of building queries makes the implementation details of the collaborators facets and sources facets different from the projects facets.

6.1.1 Implementation of Projects Facet

Building a query for retrieving the list of projects depends on the logged in user, selected collaborators and selected sources. It also depends on the selected project(s) as the projects that are already selected should remain in the list of projects irrespective of the selection of the collaborators and sources. Thus the flow chart of the facet Project looks like Figure 6:

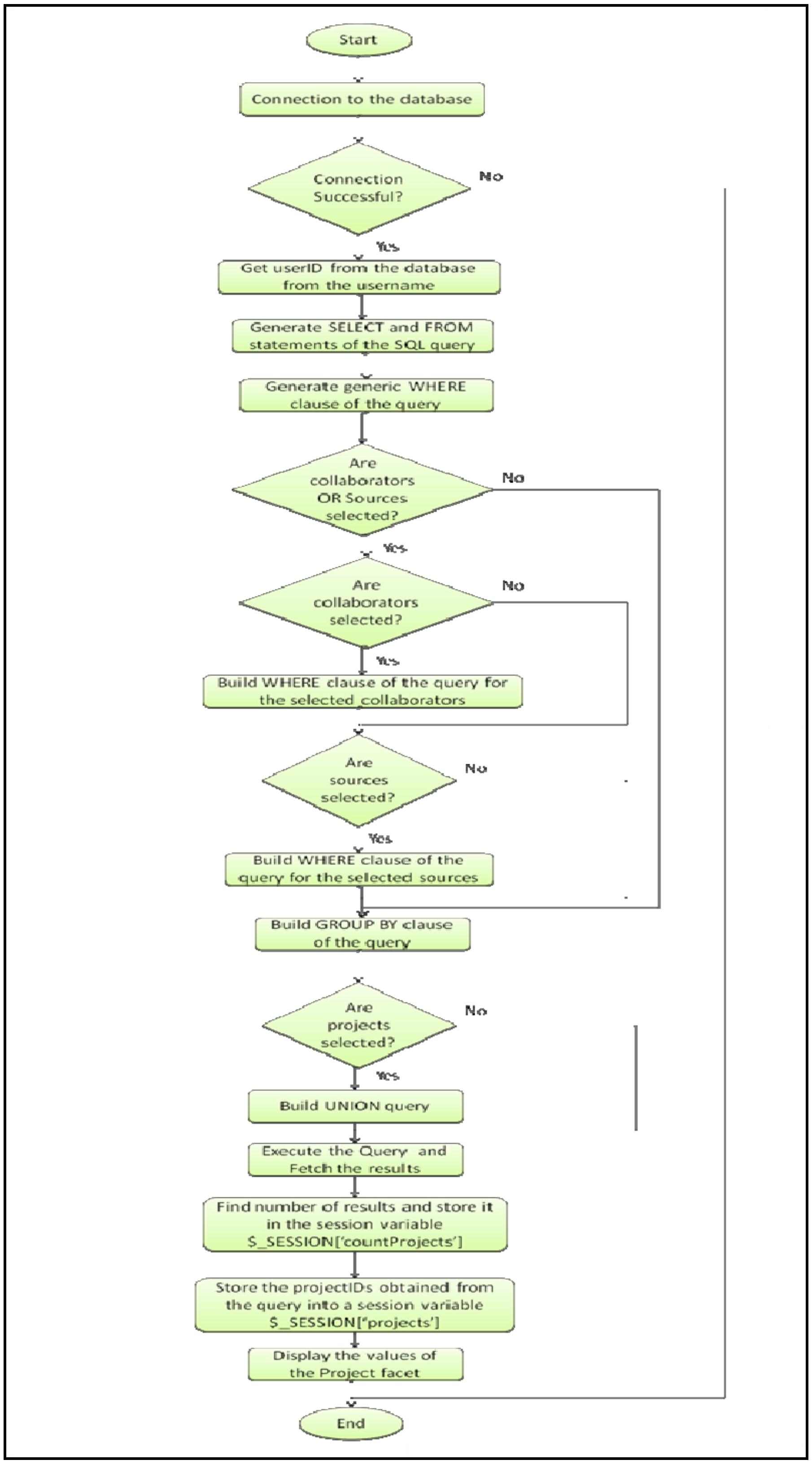

Start
Connection to the database
Connection Successful?
No
Yes
Get userID from the database from the username
Generate SELECT and FROM statements of the SQL query
Generate generic WHERE clause of the query
Are collaborators OR Sources selected?
No
Yes
Are collaborators selected?
No
Yes
Build WHERE clause of the query for the selected collaborators
Are sources selected?
No
Yes
Build WHERE clause of the query for the selected sources
Build GROUP BY clause of the query
Are projects selected?
No
Yes
Build UNION query
Execute the Query and Fetch the results
Find number of results and store it in the session variable $_SESSION['countProjects']
Store the projectIDs obtained from the query into a session variable $_SESSION["projects']
Display the values of the Project facet
End

Figure 6: Flow chart for the implementation of Projects facet

As the flow chart shows, once the query is executed on the database, redrawProjects.php calculates number of projects returned by the query and puts this value in the session variable $_SESSION['countProjects']. Similarly, it also stores the projectIDs returned by the query in the session variable array $_SESSION['projects'][$j]. These two session variables are then used while retrieving the list of collaborators and the list of sources as these facets depend on the projects.

The query submitted by the logged in user (userID=1) to the database when two sources (‘google’ and ‘unc’) and three collaborators (userID=6, userID=7, userID=8) are selected with one project pre-selected (projectID=1) looks like this:

```
SELECT projects.title, projects.projectid
FROM projects, memberships, pages
WHERE memberships.projectid=projects.projectid AND memberships.userid=1
          AND projects.projectid IN
                (SELECT projectid FROM memberships
                WHERE userid=6 AND projectid IN
                        (SELECT projectid FROM memberships
                        WHERE userid=7 AND projectid IN
                                (SELECT projectid FROM memberships
                                WHERE userid=8
                                )
                        )
                )
         AND pages.projectid IN
                (SELECT DISTINCT projects.projectid FROM projects, pages
                WHERE pages.projectid=projects.projectid AND pages.userid=1)
         AND pages.projectid=projects.projectid
         AND (source='unc' or source='google')
GROUP BY projects.title
UNION
SELECT projects.title, projects.projectid
FROM projects, memberships
WHERE projects.projectid=memberships.projectid AND projects.projectid='1'
```

6.1.2 Implementation of Collaborators/Sources Facet

As mentioned above, implementation of the facets Collaborators and Sources is very similar to each other but varies from that of the facet Project. Similar to building a query for retrieving the list of projects, building the query for facets sources or collaborators depends on the logged in user, selected projects and selected sources/collaborators. However, if no projects are selected then also the query building depends on the list of projects present for the given selection of collaborators and source. And finally the query also depends on the selected collaborator(s)/source(s) as they should remain in the list irrespective of the selection of the collaborators, sources and projects. The flow chart for the implementation of the facet collaborators is shown in Figure 7 which is very similar to that of the implementation of the facet sources. As can be seen, the flow chart in Figure 7 varies slightly from the flow chart of the implementation of the projects facet.

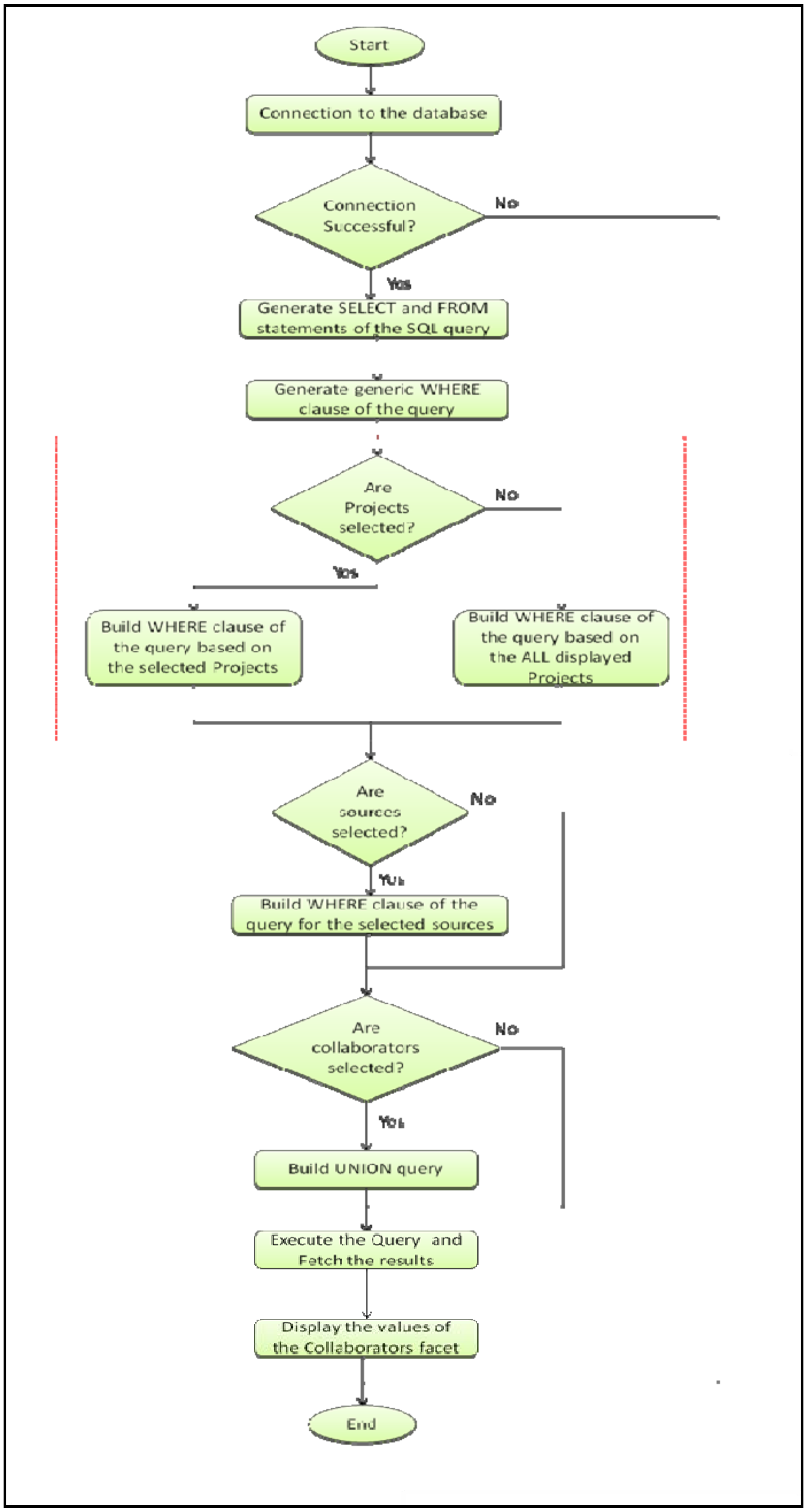

Start
Connection to the database
Connection Successful?
No
Yes
Generate SELECT and FROM statements of the SQL query
Generate generic WHERE clause of the query
Are Projects selected?
No
Yes
Build WHERE clause of the query based on the selected Projects
Build WHERE clause of the query based on the ALL displayed Projects
Are sources selected?
No
Yes
Build WHERE clause of the query for the selected sources
Are collaborators selected?
No
Yes
Build UNION query
Execute the Query and Fetch the results
Display the values of the Collaborators facet
End

Figure 7: Flow chart for the implementation of Collaborators facet

The dotted rectangle in Figure 7 highlights the dependency of the query on the facet Projects. If values from facet project are selected then the query is built using the selected values of the projects and if the values are not selected then the query is built based on all the displayed projects. This can be further explained by the sample queries that the php page generates as shown in the Table 1.

Projects selected	**Projects not selected**
Selections: Sources: google, unc **Projects : 1, 8**	*Selections:* Sources:google, unc **Projects: none**
Query: SELECT DISTINCT username, users.userid FROM memberships, users, pages WHERE users.userid=memberships.userid AND (memberships.projectid=8 OR memberships.projectid=1) AND pages.userid=users.userid AND (source='unc' OR source='google')	*Query:* SELECT DISTINCT username, users.userid FROM memberships, users, pages WHERE users.userid=memberships.userid AND (memberships.projectid=9 OR memberships.projectid=17 OR memberships.projectid=8 OR memberships.projectid=1 OR memberships.projectid=7 OR memberships.projectid=86) AND pages.userid=users.userid AND (source='unc' OR source='google')

Table 1: Comparison of queries for building facet collaborator with and without projects selected

6.2 Implementation of List View

The List View displays the list of the results obtained by the selected combination of the projects, collaborators and the sources. Implementation of the List View is very similar to that of any of the facets. Once the user selects Projects, Collaborators and Sources from the facets they are stored in the session variable arrays $_SESSION['qproj'], $_SESSION['qcollab'] and $_SESSION['qsource'] respectively. To build the SQL query for the list view it is first checked that at least one of these arrays is not empty. A generic query including the *select* statement and the *from* clause are then built and then, for the session variable arrays which are not empty, a loop is run through the length of the array which builds the *where* clause of the query as shown in the Code Segment 4.

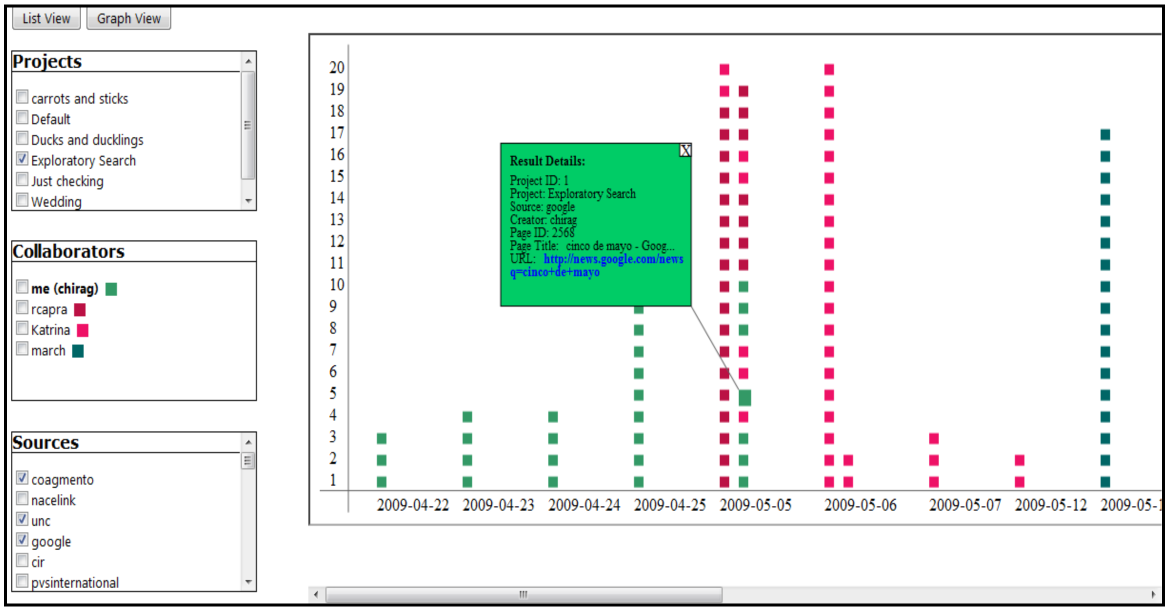
```
/* -- Where clause for the selected collaborators -- */
if(count($_SESSION['qcollab']) != 0)
{
      $collabClause = " AND (";
      /* -- Loop runs for the number of times equal to the number
      of collaborators selected -- */
      for($i=0; $i<count($_SESSION['qcollab']); $i++)
      {
       $collabClause.=" users.userid =".$_SESSION['qcollab'][$i];
       if(($i+1) != count($_SESSION['qcollab']))
            /* -- OR operation is performed only up to last but
one collaborator -- */
            $collabClause.=" OR";
      }
      $collabClause.=" )";
      $query.=$collabClause;
}
```

Code Segment 4: Building a where clause for collaborators

Similar code generates a *where* clause for the selected projects and the selected sources. Once the query is built, it is executed and the results are returned in the table format. Additional checks are also provided to notify the user if the query returns zero results or if no value from any of the facets is selected.

6.3 Implementation of Graph View

The web-interface of the faceted search results provides two views: the List View and the Graph View. Section 6.2 describes the details of the implementation of the List View. Implementation of the Graph View is similar to that of the List View as far as building the SQL query, connecting to the database and retrieving the results are concerned. However, the List View displays the results in a tabular form whereas the Graph View presents the same results on a timeline graph to display the number of searches performed across time. Each result is displayed on the graph in the form of small rectangular blocks. Further functionality is provided to click on the rectangular block to display the details of that result. The results are also color coded to know the user to whom the result belongs. This is shown in Figure 8.



Result Details:
Project ID: 1
Project: Exploratory Search
Source: google
Creator: chirag
Page ID: 2568
Page Title: cinco de mayo - Goog...
URL: http://news.google.com/news q=cinco+de+mayo

Figure 8: Faceted Search Interface – Graph View

The graph is drawn using Scalable Vector Graphics (SVG). The page redrawResultsGraph.php creates an SVG file which is embedded in the main page using an HTML iframe tag.

6.3.1 Plotting of Coordinate Axes

SVG offers various shape elements like line, rectangle, text, circle, etc. that can be directly used. Thus the axes of the graph can be plotted using elements line and text. Y-axis of the graph is a static one as it always displays the numbers from 1 to 20 as the number of results. However, dates that are plotted on the X-axis vary depending upon the range of the dates for the given set of results obtained from the SQL query. Also, while plotting any SVG element its position must be given. This is achieved for x-axis using Code Segment 5.

```
$x1=-20;
$y1=407;
$previousDate="";
while ($results = mysql_fetch_array($graphQuery, MYSQL_BOTH)) {
      $id = uniqid ();
      if($previousDate == $results['date']){
            $y1=$y1-20;
      }
      /*-- Plot X-Axis --*/
      else{
            $x1=$x1+90;
            $y1=407;
            $date = $results['date'];
            $text = $parser->addChild('text',$date);
            $text->addAttribute('x',$x1);
            $text->addAttribute('y','438');
      }
      /*-- Only 20 results can be plotted along Y-axis in one
      column --*/
      if($y1 < 20){
            $x1 = $x1+20;
            $y1 = 407;
      }
      $colorCode =
      substr(sha1($results['username']),strlen(sha1($results['use
      rname']))-7,3);
      /*-- Plot points representing the results --*/
      $smallRect = $parser->addChild('rect');
      $smallRect->addAttribute('x',$x1);
      $smallRect->addAttribute('y',$y1);
      $smallRect->addAttribute('width','10');
      $smallRect->addAttribute('height','10');
      $smallRect->addAttribute('id','small_'.$id);
      $smallRect->addAttribute('style','cursor:pointer;
      fill:#'.$colorCode);
      $smallRect-
      >addAttribute('onclick','displayRect("'.$id.'")');

      $previousDate=$results['date'];
}
```

Code Segment 5: Plotting X-axis and the rectangles using SVG

As shown in the snippet, only when the SQL result array ($results) loops through the while loop, the date is changed. As the date changes, the x-coordinate is also incremented and the date is plotted on the x-axis scale.

6.3.2 Plotting of Result Points

Code segment 5 also displays code to display the rectangular block which represent the results on the graph. While the date in the result set does not change the ‘Y’ value increases and the results are plotted on the top of each other using the SVG shape element ‘rect’. However, as mentioned already, the iframe tag can fit only 20 such rectangular element in one column. Thus for the dates which have more than 20 results, another column of rectangular blocks is created immediately next to the first column. As the date changes a new column of results is plotted by shifting the x-coordinate of the ‘rect’ element. Each rectangular block representing a result has a color corresponding to the user associated with that result. This color coding is implemented by encrypting the username of each result using Secure Hash Algorithm-1 (SHA1) and then using last three characters of the encrypted string as the color code.

6.3.3 Displaying the Details of the Result

The Graph View gives the additional information about the results by capturing the frequency of the searches performed. However each rectangular block on the timeline graph represents one result and thus contains lots of related data regarding the result. To enable the user to view this data and to make the Graph View more useful, functionality is provided to display the data related to a result by clicking on the rectangular block.

As shown in Figure 8, after clicking small rectangular block a bigger rectangle element is displayed. This rectangle contains all the information related to the result clicked. This is achieved by generating big rectangles along with the small ones but hiding them by changing the ‘display’ attribute of these elements. It means when the graph is generated, equal number of big rectangles as that of small rectangles get generated. But these big rectangles are hidden by default. Thus for each small rectangle, one big rectangle, one connector line and related text elements are all created in SVG. All these big rectangle elements have the same y-coordinate but the x-coordinate varies depending upon the location of the small rectangle. The x-coordinates of all the big rectangles are generated in such a way that these rectangles will be positioned to the left side of the small rectangle. However this poses a problem for the small rectangles which are near to the y-axis as the big rectangles corresponding to these small rectangles will go out of the graph space. To avoid this big rectangles corresponding to the results of the first three dates are plotted to the right of the small rectangles representing those results and for the rest of the results, big rectangle is plotted to the left of the result. These big rectangles have the same size and are linked to the small rectangles by assigning them an *id* which matches with the *id* of the small rectangles. These elements are not visible when the SVG file is loaded due the attribute that is set for these elements:

```
$bigRect->addAttribute('display','none');
```

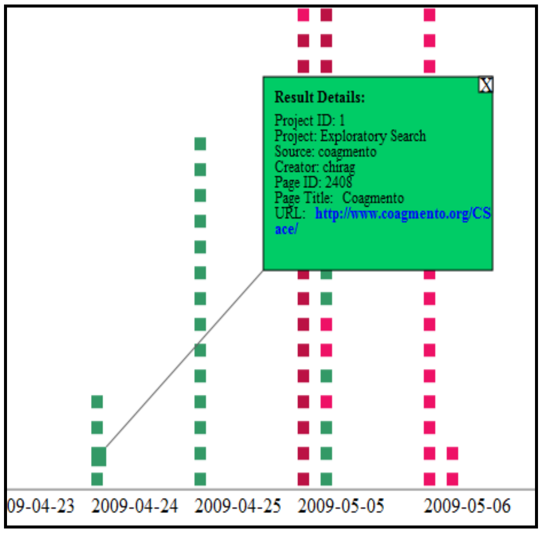
Each small rectangle has an *onClick* event set as an attribute. When user clicks on the small rectangle a javascript function, *displayRect* is fired to which an *id* of that element is passed. This javascript function changes the display property of the elements with that *id* to make it visible.

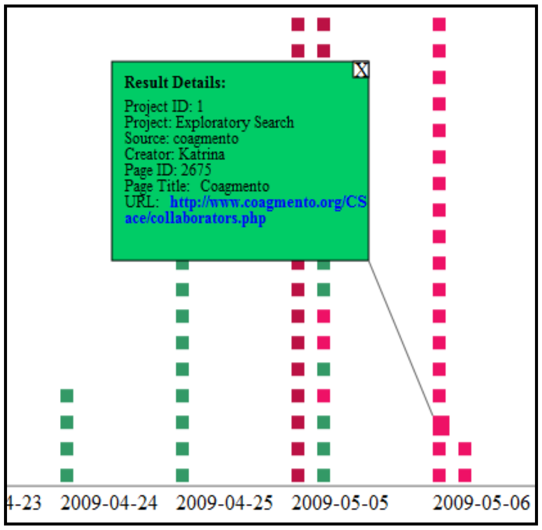
```
rectBig.setAttribute("display","inline");
```

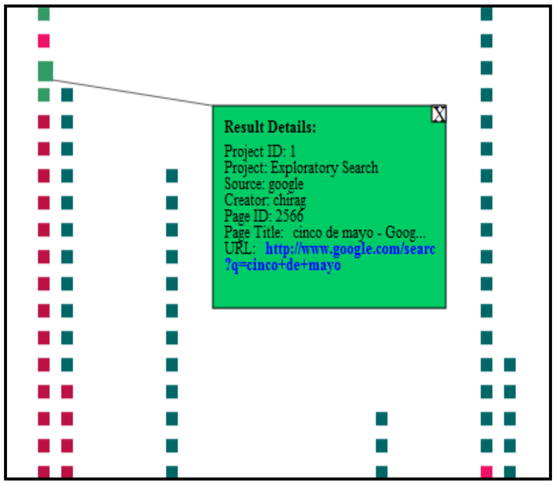
Another javascript function *hideDisplay* is written which is fired when user clicks a small ‘X’ symbol at the top-right corner of the big rectangle. This function ‘closes’ the big rectangle by changing the attribute *display* back to ‘none’. The function *displayRect* also checks if there is already one big rectangle that is ‘open’. If it is open and user tries to open another big rectangle by clicking on a small rectangle, the function displays alert message requesting the user to close the opened rectangle first.

6.3.4 Connector line

The last challenging functionality in building the Graph View was building a connector line using SVG element ‘line’ which will join the big rectangle giving the information of the result to which small rectangle corresponds. Although the y-coordinate of the big rectangle is fixed, the position of the big rectangle across x-axis is changing. Also the position of the small rectangle with respect to the corresponding big rectangle can be variable for each result. Thus a connector line with hard-coded values of end point coordinators cannot be used. Coordinates of the connector line are decided by the parametric input where the input values depend upon the location of the big rectangle and the location of the small rectangle. Thus the connector line joins the two rectangles in the most presentable way (see Figure 9).


Result Details:
Project ID: 1
Project: Exploratory Search
Source: coagmento
Creator: chirag
Page ID: 2408
Page Title: Coagmento
URL: http://www.coagmento.org/CSace/


Result Details:
Project ID: 1
Project: Exploratory Search
Source: coagmento
Creator: Katrina
Page ID: 2675
Page Title: Coagmento
URL: http://www.coagmento.org/CSace/collaborators.php


Result Details:
Project ID: 1
Project: Exploratory Search
Source: google
Creator: chirag
Page ID: 2566
Page Title: cinco de mayo - Goog...
URL: http://www.google.com/search?q=cinco+de+mayo

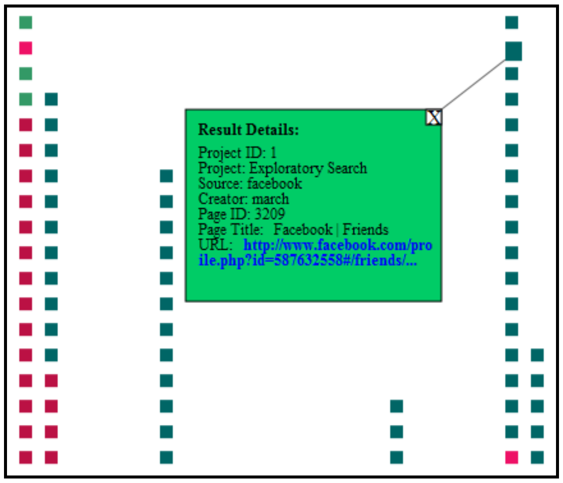

Result Details:
Project ID: 1
Project: Exploratory Search
Source: facebook
Creator: march
Page ID: 3209
Page Title: Facebook | Friends
URL: http://www.facebook.com/profile.php?id=587632558#/friends/...

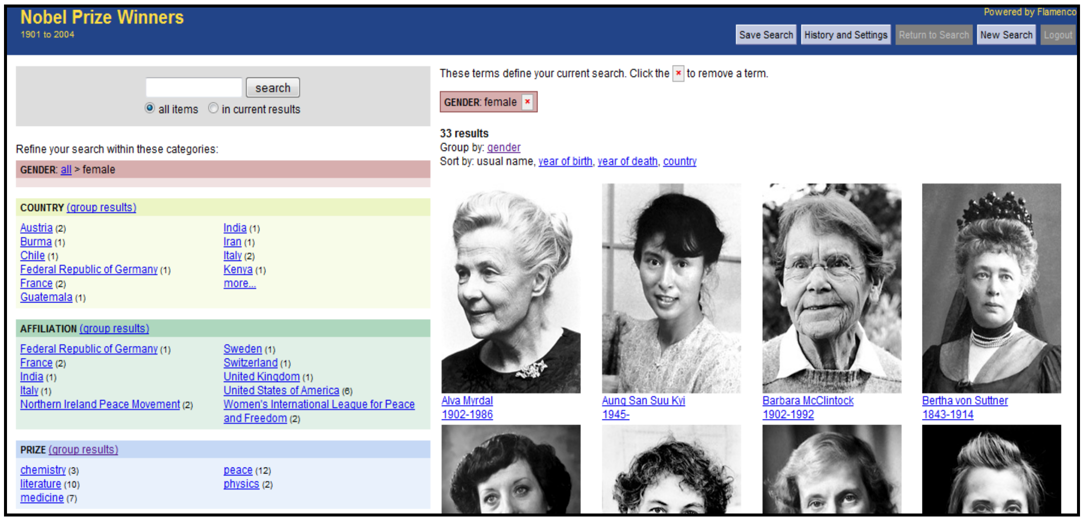
Figure 9: Connector Line positions

7. Similar Efforts

As the faceted search addresses many weaknesses of the conventional search it is attracting the attention of both the academic and commercial worlds. Many academic projects and researches are focusing on effective and efficient use of faceted search. Efforts are being made to improve the use of the faceted search by adding it with various other features such as different visualization and representation of the data retrieved from the faceted search.

One of such early efforts was initiated by the Human-Computer Interaction Lab of the University of Maryland. The project FilmFinder uses dynamic queries to explore the movie database. It lets the user filter the results with various facets such as the title of the movie, actor, actress, director, etc. and generate queries dynamically according to the selection a user had made (Ahlberg & Shneiderman, 1994). The project enables these facets by providing a sliding bar for each of the facets. However, the length of the sliding bar does not change dynamically depending upon the result sets available. Nevertheless this search interface proves useful to find the dense and non-dense sections of the multidimensional search space (Tunklang, 2009). FilmFinder project also displays the movies in the form of a color-coded dot in a graph of Popularity versus Year of Production. Our project adopts a similar approach of color coding the data in the graphical representation to make the sense-making task easy. FilmFinder project is considered to be one of the pioneer projects in the field of faceted search.

The Flamenco project is one of the foundation works in the field of faceted search undertaken at the University of California, Berkeley. This project interface is shown Figure 10:



Refine your search within these categories:

GENDER: all > female

COUNTRY (group results)
Austria (2)
Burma (1)
Chile (1)
Federal Republic of Germany (1)
France (2)
Guatemala (1)
India (1)
Iran (1)
Italy (2)
Kenya (1)
more...

AFFILIATION (group results)
Federal Republic of Germany (1)
France (2)
India (1)
Italy (1)
Northern Ireland Peace Movement (2)
Sweden (1)
Switzerland (1)
United Kingdom (1)
United States of America (6)
Women's International League for Peace and Freedom (2)

PRIZE (group results)
chemistry (3)
literature (10)
medicine (7)
peace (12)
physics (2)

These terms define your current search. Click the × to remove a term.

GENDER: female ×

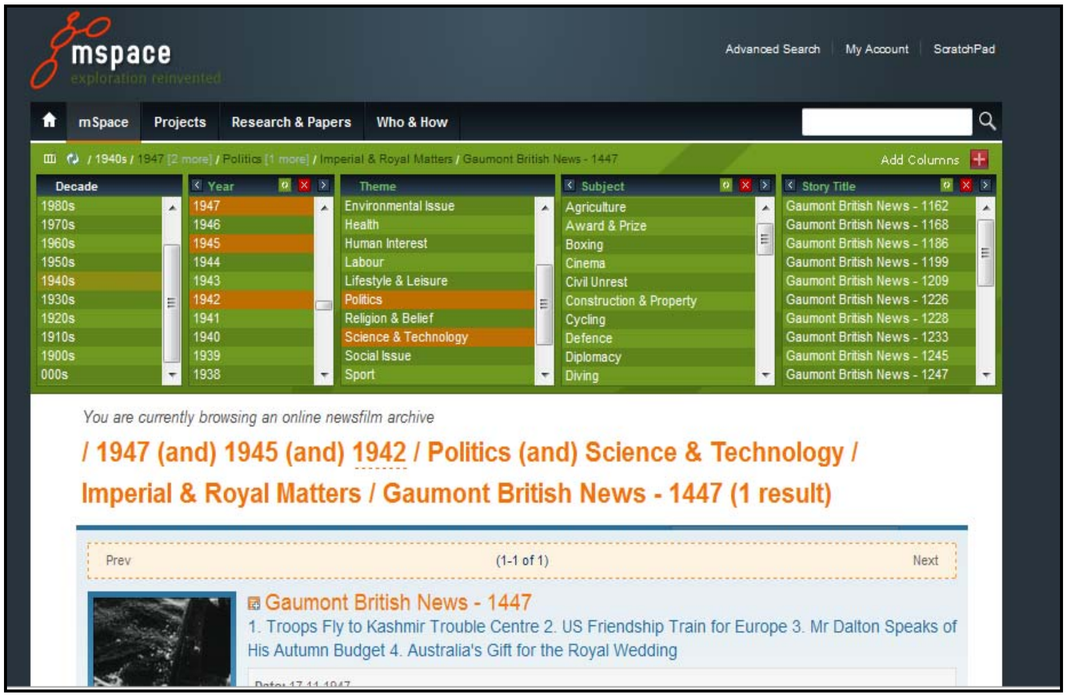
33 results
Group by: gender
Sort by: usual name, year of birth, year of death, country

Alva Myrdal
1902-1986
Aung San Suu Kyi
1945-
Barbara McClintock
1902-1992
Bertha von Suttner
1843-1914

Figure 10: Flamenco Project

Flamenco lets the user select a single value from any of the facets and filters the results accordingly. In addition to the faceted search, it also provides a search text box for performing the text search within whole set of results as well as within the current selection. This text searching feature strengthens the faceted search. As Hearst (2006) describes, Flamenco limits the length of the facets by restricting the number of facet values shown for each facet and gives an option to the user to see more facet values only if necessary. One of the limitations of the Flamenco project is that it does not allow the users to select more than one facet values from the same facet.

Another example of a faceted interface is the project mSpace. This project was led by schraefel m.c. at the University of Southampton. Unlike the aforementioned projects, mSpace allows selecting multiple values from the same facet. Another feature that this project offers is that of adding or removing the facets from the list of facets. This improves the usability of the interface and provides the users with a power to navigate through the results more effectively. As Tunklang (2009) describes, this project has a greater focus on user interface issues than on the faceted interface issues. mSpace enables easy access to the information and lets the user explore the information in a structured way (schraefel, m. c., Karam, M., and Zhao, S. 2003). The screenshot of the mSpace project is shown below:



/ 1940s / 1947 [2 more] / Politics [1 more] / Imperial & Royal Matters / Gaumont British News - 1447

Decade	Year	Theme	Subject	Story Title
1980s	1947	Environmental Issue	Agriculture	Gaumont British News - 1162
1970s	1946	Health	Award & Prize	Gaumont British News - 1168
1960s	1945	Human Interest	Boxing	Gaumont British News - 1186
1950s	1944	Labour	Cinema	Gaumont British News - 1199
1940s	1943	Lifestyle & Leisure	Civil Unrest	Gaumont British News - 1209
1930s	1942	Politics	Construction & Property	Gaumont British News - 1226
1920s	1941	Religion & Belief	Cycling	Gaumont British News - 1228
1910s	1940	Science & Technology	Defence	Gaumont British News - 1233
1900s	1939	Social Issue	Diplomacy	Gaumont British News - 1245
000s	1938	Sport	Diving	Gaumont British News - 1247

You are currently browsing an online newsfilm archive

/ 1947 (and) 1945 (and) 1942 / Politics (and) Science & Technology / Imperial & Royal Matters / Gaumont British News - 1447 (1 result)

Prev (1-1 of 1) Next

Gaumont British News - 1447

1. Troops Fly to Kashmir Trouble Centre 2. US Friendship Train for Europe 3. Mr Dalton Speaks of His Autumn Budget 4. Australia's Gift for the Royal Wedding

Date: 17.11.1947

Figure 11: mSpace Project

Mspace project displays the results only in a list form and does not provide any other representation of the results to the users. In this aspect our project differs by providing multiple views including the graph view which can give the overview of the results displayed across the time line.

Relation Browser project at the School of Information and Library Science, UNC is a project that investigate into the faceted search interface. It provides a graphical presentation of the number of results available for each facet value. It also lets the users to explore the results by hovering mouse over the facets. As Capra et al (2007) note, Relation Browser project focuses on the usefulness of the faceted search while noting the need for further investigating the effectiveness of the search process based on the construction of the facets.

8. Future Scope

Our project successfully builds a web-application to retrieve collaborative search results using a faceted search. The project also enables the user to view her own as well as her collaborators' results in a graphical form. Currently, the project interface, although it fetches the results from the database of *Coagmento*, is not fully integrated with *Coagmento* system (e.g. website and toolbar). This interface will prove more useful when integrated with the "live" Coagmento collaborative information seeking system.

The project uses SVG to plot the graph of the results on the timeline. It is worthwhile to investigate a framework such as Google API for charts which may provide a simpler and more elegant way to develop a graph. Such framework, if used, could support greater functionality for the Graph View. In the current functionality, the x-axis of the graph displays all dates one after the other. This can potentially increase the width of the graph unpredictably. This can be avoided by building a user-specified dynamic time line view. In a dynamic time line view a user can select the interval of the dates. For example, if the dates are ranging from 1st Jan 2009 to 5th September 2010 then the user can have an option to display the results for each day or user can 'zoom out' the results and choose to display the results for each week or each month.

Use of the Google API could also eliminate cross-browser incompatibility issues. The Graph View that is developed using SVG can be viewed in all the major browsers except for Internet Explorer. None of the versions of Internet Explorer except for IE9 (which is yet to be launched as of this writing in the fall of 2010) support SVG. Although Google API uses SVG as an underlying technology, it does work with Internet Explorer by converting the SVG into PNG format. This however, is a minor issue as the Coagmento framework, so far, works only with the Firefox browser and thus the faceted search interface built on top of this framework may be used primarily with the Firefox browser.

Another addition to the existing interface would be that of search functionality. As mentioned in the use cases, if a user Mark remembers a word from his search results then having search functionality can help him find the results more effectively. Faceted search along with an advanced search can help users to interact with the results more effectively.

While developing this project a great emphasis was placed on implementing the required functionality. Much work needs to be done to improve the interface from usability perspective. The interface can further be improved so that the user can interact with it without having much prior knowledge of faceted search.

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Appendix

1. Code for mainPage.php

```
<?php
Header('Cache-Control: no-cache');
Header('Pragma: no-cache');
?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "
http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
<head>
<title>Multi-faceted Results</title>
<link rel="stylesheet" type="text/css" href="style.css" />
<meta http-equiv="Content-type" content="text/html; charset=utf-8" />
<script type="text/javascript" src="jquery.js"></script>
<script type="text/javascript">
// window.displayMode = "list";
function fillPage()
{
redraw();
}
function redraw()
{
var value = $("#username").val();
document.getElementById("results").innerHTML = "<img
src='loading.gif'/>";
document.getElementById("projectsDiv").innerHTML = "<img
src='loading.gif'/>";
document.getElementById("collaboratorsDiv").innerHTML = "<img
src='loading.gif'/>";
document.getElementById("sourcesDiv").innerHTML = "<img
src='loading.gif'/>";
$.post(
"redrawProjects.php",
$("#controller").serialize(),
function(data)
{
$("#projects").html(data);
document.getElementById("projectsDiv").innerHTML =
"Projects";
}
);
$.post(
"redrawCollaborators.php",
$("#controller").serialize(),
function(data)
{
$("#collaborators").html(data);
document.getElementById("collaboratorsDiv").innerHTML =
"Collaborators";
}
);
$.post(
"redrawSources.php",
$("#controller").serialize(),
function(data)
{
$("#sources").html(data);
document.getElementById("sourcesDiv").innerHTML = "Sources";
}
);
$.post(
"redrawResultsList.php",
$("#controller").serialize(),
function(data)
{
$("#results").html(data);
}
);
if (window.displayMode == "graph")
{
fnGraphView();
}
}
function fnGraphView (){
window.displayMode = "graph";
$.post(
"redrawResultsGraph.php",
$("mainView").serialize(),
function (data){
data = data + "px";
// alert(data);
document.getElementById("results").style.display="none";
document.getElementById("resultsGraph").style.display="";
document.getElementsByTagName("iframe")[0].src += "?i=" + (new Date()).
getTime();
document.getElementById("iframe").style.width = data;
}
);
}
function fnListView(){
window.displayMode = "list";
document.getElementById("results").style.display="";
document.getElementById("resultsGraph").style.display="none";
}
</script>
</head>
<body onload="fillPage()">
<?php
session_start();
$username = $_GET['username'];
$_SESSION['username']=$username;
echo ("<input type='hidden' id='username' name='username'
value='$username' />");
?>
<form method="POST" id="controller">
<input type="hidden" name="username" value=<?php echo $username ?> />
<div class="bucket top scrollable box"><div class="facetHeading
smallBox" id="projectsDiv">Projects</div>
```

```
<p id="projects"> </p></div>
<div class="bucket center scrollable box"><div class="facetHeading
smallBox" id=
"collaboratorsDiv">Collaborators</div>
<p id="collaborators"> </p></div>
<div class="bucket bottom scrollable box"><div class="facetHeading
smallBox" id=
"sourcesDiv">Sources</div>
<p id="sources"> </p></div>
<p><input type="button" id="list" value="List View"
onClick="fnListView()"/>
<input type="button" id="graph" value="Graph View"
onClick="fnGraphView()"/>
</p>
<p class="scrollable mainView box" id="results" style="width:70%"></p>
<p class="scrollable mainView" id="resultsGraph" style="display:none">
<iframe src="http://idl63.ils.unc.edu/ketan/revised/new/final/<?php
echo
$username.'.svg'; ?>" height="450" id="iframe">
</iframe>
</p>
</form>
</body>
</html>
```

2. Code for redrawProjects.php

```
<?php
$username=$_POST['username'];
session_start();
require ("connection.php");
include ("checkedFacets.php");
$_SESSION['qproj'] = extractCheckedProjects($_POST);
$_SESSION['qcollab'] = extractCheckedCollaborators($_POST);
$_SESSION['qsource'] = extractCheckedSources($_POST);
$user=mysql_query ("SELECT userid FROM users WHERE
username='$username';");
/* -- Fetches userid from the username -- */
$users=mysql_fetch_array($user, MYSQL_BOTH);
$userid=$users['userid'];
/* -- Basic query structure -- */
$query="SELECT projects.title, projects.projectid FROM projects,
memberships, pages
WHERE memberships.projectid=projects.projectid";
/* -- No collaborators or sources selected -- */
if(count($_SESSION['qcollab']) == 0 && count($_SESSION['qsource']) ==
0){
/* -- Sample query: SELECT projects.title, projects.projectid FROM
projects,
memberships, pages WHERE memberships.projectid=projects.projectid
AND memberships.userid=1 GROUP BY projects.title -- */
/* -- English language query: Display project title and project ID when
userid is 1 -- */
```

```
$whereClause=" AND memberships.userid=$userid";
$query=$query.$whereClause;
}
/* -- Either collaborators or source or both are selected -- */
else{
/* -- Collaborators are selected -- */
if(count($_SESSION['qcollab']) != 0){
/* -- Sample query: SELECT projects.title, projects.projectid FROM
projects,
memberships, pages WHERE memberships.projectid=projects.projectid
AND memberships.userid=1 AND projects.projectid IN (SELECT projectid
FROM
memberships WHERE userid=6) -- */
/* -- English language query: Display project titles which are common
between the
logged in user (userid=1) and selected user (userid=6) -- */
/* -- where clause for the query for the selected collaborator(s) -- */
$collabClause = " AND memberships.userid=$userid AND projects.projectid
IN";
for($i=0; $i<count($_SESSION['qcollab']); $i++){
/* -- Depending upon the selected collaborators, number of subqueries
will get
written to find the common projects between all
the selected collaborators -- */
$collabClauseLoop.=" (SELECT projectid FROM memberships WHERE
userid=".$_SESSION
['qcollab'][$i];
if(($i+1) != count($_SESSION['qcollab']))
/* -- Innermost subquery will get executed only up to last but one
collaborator -- */
$collabClauseLoop.=" AND projectid IN";
}
/* -- Closing braces for all the subqueries -- */
for($i=0; $i<count($_SESSION['qcollab']); $i++){
$collabClauseLoop.=")";
}
/* -- Appends where clause to the general query structure -- */
$query.=$collabClause.$collabClauseLoop;
}
if(count($_SESSION['qsource']) != 0){
/* -- Sample query: SELECT projects.title, projects.projectid FROM
projects,
memberships, pages WHERE memberships.projectid=projects.projectid AND
memberships.projectid IN (SELECT DISTINCT projects.projectid FROM
projects,
memberships WHERE memberships.projectid=projects.projectid AND
pages.userid=1) AND projects.projectid=pages.projectid AND (
source='coagmento'
OR source='nacelink') GROUP BY projects.title -- */
/* -- English language query: Display project title and project ID when
projectid
from the pages table is in the diplayed list of projects -- */
/* -- where clause for the query for the selected source(s) -- */
$sourceClause = " AND pages.projectid IN (SELECT DISTINCT
projects.projectid FROM
projects, pages
WHERE pages.projectid=projects.projectid AND pages.userid=$userid) AND
pages.projectid=projects.projectid AND (";
for($i=0;$i<count($_SESSION['qsource']); $i++){
/* -- Depending upon the number of selected sources, "logical 'or'
operation"
will be performed -- */
$sourceClauseLoop.=" source='".$_SESSION['qsource'][$i]."'";
if(($i+1) != count($_SESSION['qsource']))
/* -- 'OR' operation is performed only up to last but one source -- */
$sourceClauseLoop.= " or";
}
$sourceClauseLoop.=")";
/* -- Appends where clauses to the general query structure -- */
$query.=$sourceClause.$sourceClauseLoop;
}
}
/* -- Final group by clause of the query -- */
$groupBy=" GROUP BY projects.title";
/* -- Final query -- */
/* -- Sample query: SELECT projects.title, projects.projectid FROM
projects, memberships,
pages WHERE memberships.projectid=projects.projectid
AND memberships.userid=1 AND projects.projectid IN (SELECT projectid
FROM memberships
WHERE userid=1 AND projectid IN
(SELECT projectid FROM memberships WHERE userid=6)) AND pages.projectid
IN (SELECT
DISTINCT projects.projectid FROM projects, pages
WHERE pages.projectid=projects.projectid AND pages.userid=1) AND
pages.projectid=projects.projectid AND
( source='coagmento' or source='unc') GROUP BY projects.title -- */
/* -- English language query: Display all the project titles on which
logged in user
(userid=1) and userid=6 have worked and have sources 'coagmento' and
'unc' -- */
$query.=$groupBy;
/* -- Query to maintain the selected project throughout the session */
for($i=0; $i<count($_SESSION['qproj']); $i++){
$sessionProj[$i]=$_SESSION['qproj'][$i];
$sessionProj[$i]=str_replace('@',' ',$sessionProj[$i]);
/* -- Sample query: UNION SELECT projects.title, projects.projectid
FROM projects,
pages WHERE projects.projectid=pages.projectid AND
projects.projectid='9' -- */
$union=" UNION SELECT projects.title, projects.projectid FROM projects,
memberships
WHERE projects.projectid=memberships.projectid AND projects.projectid='
$sessionProj[$i]'";
/* -- Appending the query with the other query -- */
$query.=$union;
}
/* -- Echoing SQL queries for the test purpose -- */
// echo $query."<br>";
$userProjects=mysql_query($query);
/* -- Number of rows of the result of $quertCount are stored in a
session variable to use
across the session -- */
$_SESSION['countProjects']=mysql_num_rows($userProjects);
```

```
$j=0;
/* -- Fetch the project titles in an array and display them in the
Project facet -- */
while($projects=mysql_fetch_array($userProjects,MYSQL_BOTH)) {
$countProject=mysql_fetch_array($countProjects,MYSQL_BOTH);
$projectTitle = str_replace(' ','@',$projects['title']);
$projectID = $projects['projectid'];
/* -- Stores the displayed project in the session variable array to be
used in the
collaborator query in redrawCollaborators.php -- */
$_SESSION['projects'][$j]=$projectID;
/* -- Creates a checkbox for the project and fires an onlcick event
redraw() when a
project is checked -- */
$str = "<input type=checkbox name='proj".$j++. "' value=$projectID id=
$projectID onclick=";
$str .= "redraw(\"";
$str .= $projectID;
$str .= "\")";
for($k=0; $k< count($_SESSION['qproj']); $k++){
if($projectID==$_SESSION['qproj'][$k])
$str .= " checked='true'";
}
$str .= " />";
echo $str;
echo $projects['title'];
echo "<br/>";
}
?>
```

3. Code for redrawCollaborators.php

```
<?php
require ("connection.php");
include ("checkedFacets.php");
session_start();
$username = $_POST['username'];
$_SESSION['qproj'] = extractCheckedProjects($_POST);
$_SESSION['qcollab'] = extractCheckedCollaborators($_POST);
$_SESSION['qsource'] = extractCheckedSources($_POST);
$user=mysql_query ("select userid from users where
username='$username';");
$users=mysql_fetch_array($user, MYSQL_BOTH);
$userid=$users['userid'];
/* -- General query structure -- */
$query = "SELECT DISTINCT username, users.userid FROM memberships,
users, pages WHERE
users.userid=memberships.userid";
/* -- Query when projects are not selected -- */
if(count($_SESSION['qproj']) == 0){
/* -- Sample query: SELECT DISTINCT username, users.userid FROM
memberships, users,
pages WHERE users.userid=memberships.userid
AND ( memberships.projectid=9 OR memberships.projectid=10 OR
memberships.projectid=87 OR memberships.projectid=17 OR
memberships.projectid=8
OR memberships.projectid=1 OR memberships.projectid=7 OR
memberships.projectid=93
OR memberships.projectid=86) -- */
/* -- English language query: Display all the users for the projects
displayed for the
logged in user. The list projects is obtained from the
session variable created in redrawProjects.php -- */
/* -- General where clause -- */
$whereClause=" AND (";
/* -- Loop runs for the number of projects displayed which is obtained
from the session
variable from redrawProjects.php -- */
for($i=0;$i<$_SESSION['countProjects'];$i++){
$whereClause.=" memberships.projectid=". $_SESSION['projects'][$i];
if(($i+1) != $_SESSION['countProjects'])
/* -- OR operation is performed only up to last but one project -- */
$whereClause.=" OR";
}
$whereClause.=")";
/* -- Appends whereClause to the general query -- */
$query.=$whereClause;
}
/* -- Either projects or sources or both are selected -- */
else{
/* -- Projects are selected -- */
if(count($_SESSION['qproj']) != 0){
/* -- Sample query: SELECT DISTINCT username, users.userid FROM
memberships, users,
pages WHERE users.userid=memberships.userid
AND ( memberships.projectid=1) -- */
/* -- English language query: Display collaborators for the selected
projects -- */
/* -- General where clause -- */
$projectClause=" AND (";
/* -- Loop runs for the number of times equal to the number of projects
selected --
*/
for($i=0;$i<count($_SESSION['qproj']);$i++){
$projectClause.=" memberships.projectid=". $_SESSION['qproj'][$i];
if(($i+1) != count($_SESSION['qproj']))
/* -- OR operation is performed only up to last but one project -- */
$projectClause.=" OR";
}
$projectClause.=")";
}
$query.=$projectClause;
}
/* -- Sources are selected. With or without projects -- */
if(count($_SESSION['qsource']) != 0){
/* -- Sample queries:
1. With NO projects selected
SELECT DISTINCT username, users.userid FROM memberships, users, pages
WHERE
users.userid=memberships.userid
AND ( memberships.projectid=9 OR memberships.projectid=17 OR
memberships.projectid=8 OR memberships.projectid=1 OR
memberships.projectid=7
OR memberships.projectid=86) AND pages.userid=users.userid AND (
source='coagmento')
2. With project(s) selected
SELECT DISTINCT username, users.userid FROM memberships, users, pages
WHERE
users.userid=memberships.userid
AND ( memberships.projectid=7 OR memberships.projectid=86) AND
pages.userid=users.userid AND ( source='coagmento') -- */
/* -- English language queries:
1. With NO projects selected
Display all the collaborators for the selected source(s) who have
worked on the
displayed projects
2. With project(s) selected
Display the collaborators for the selected source(s) who have worked on
the
selected project(s) -- */
/* -- General where clause -- */
$sourceClause = " AND pages.userid=users.userid AND (";
/* -- Loop runs for the number of times equal to the number of sources
selected -- */
for($i=0; $i<count($_SESSION['qsource']); $i++){
$sourceClause.=" source='".$_SESSION['qsource'][$i]."'";
if(($i+1) != count($_SESSION['qsource']))
/* -- OR operation is performed only up to last but one source -- */
$sourceClause.=" OR";
}
$sourceClause.=")";
$query.=$sourceClause;
}
/* -- Query to maintain the selected collaborators while selected other
facets -- */
if(count($_SESSION['qcollab']) != 0){
/* -- Sample query: SELECT DISTINCT username, users.userid FROM
memberships, users,
pages WHERE users.userid=memberships.userid AND (
memberships.projectid=1)
UNION SELECT DISTINCT username, users.userid FROM memberships, users
WHERE
users.userid=memberships.userid AND memberships.userid='6' -- */
$union=" UNION";
for ($i=0; $i<count($_SESSION['qcollab']); $i++){
$union.=" SELECT DISTINCT username, users.userid FROM memberships,
users WHERE
users.userid=memberships.userid AND
memberships.userid='". $_SESSION['qcollab'][$i]."'";
if(($i+1) != count($_SESSION['qcollab']))
$union.=" UNION";
}
$query.=$union;
}
/* -- Print out query to testing purpose -- */
// echo $query."<br>";
$participant = mysql_query($query);
$i=0;
```

```
while($collaborators=mysql_fetch_array($participant,MYSQL_BOTH)) {
$collab= str_replace(' ', '@', $collaborators['username']);
$collabid = $collaborators['userid'];
/* -- Creates a checkbox for each collaborator and fires an onclick
even to call a
function redraw() -- */
$str = "<input type=checkbox name='collab".$i++. "' value=$collabid
id=$collabid
onclick=";
$str .= "redraw(\"";
$str .= $collabid;
$str .= "\")";
for($k=0; $k< count($_SESSION['qcollab']); $k++){
if($collabid==$_SESSION['qcollab'][$k])
$str .= " checked='true'";
}
$str .= " />";
echo $str;
$collabName=$collaborators['username'];
$colorCode = substr(sha1($collabName),strlen(sha1($collabName))-7,3);
/* -- Logged in user is diplayed as "me" in the list of collaborators -
- */
if($collabid == $userid){
$collabName="<b>me ($username)</b>";
}
echo $collabName."&nbsp;<span class='rectangle' style='font-size:10px;
background-color:#".$colorCode."'>&nbsp;&nbsp;&nbsp;&nbsp;</span>";
echo "<br/>";
}
?>
```

4. Code for redrawSource.php

```
<?php
require ("connection.php");
include ("checkedFacets.php");
session_start();
$username = $_POST['username'];
$_SESSION['qproj'] = extractCheckedProjects($_POST);
$_SESSION['qcollab'] = extractCheckedCollaborators($_POST);
$_SESSION['qsource'] = extractCheckedSources($_POST);
$user=mysql_query ("select userid from users where
username='$username';");
$users=mysql_fetch_array($user, MYSQL_BOTH);
$userid=$users['userid'];
/* -- General query structure -- */
$query="SELECT DISTINCT source FROM pages WHERE";
/* -- Collaborators are selected -- */
if(count($_SESSION['qcollab']) != 0){
$collabClause.=" (";
/* -- Loop runs for the number of times equal to the number of
collaborators selected
-- */
for($i=0; $i<count($_SESSION['qcollab']); $i++){
$collabClause.=" pages.userid=".$_SESSION['qcollab'][$i];
if(($i+1) != count($_SESSION['qcollab']))
/* -- OR operation is performed only up to the last but one selected
collaborator -- */
$collabClause.=" OR";
}
$collabClause.=" )";
/* -- Append the collabClause to the general query -- */
$query.=$collabClause;
}
if(count($_SESSION['qcollab']) == 0)
$projectClause = " (";
else
$projectClause = " AND (";
/* -- Projects are selected -- */
if(count($_SESSION['qproj']) != 0){
/* -- Loop runs for the number of times equal to the number of projects
selected -- */
for($i=0; $i<count($_SESSION['qproj']); $i++){
$projectClause.=" pages.projectid=".$_SESSION['qproj'][$i];
if(($i+1) != count($_SESSION['qproj'])){
/* -- OR operation is performed only up to the last but one selected
project --
*/
$projectClause.=" OR";
}
}
}
else{
for($i=0; $i<$_SESSION['countProjects']; $i++){
$projectClause.=" pages.projectid=".$_SESSION['projects'][$i];
if(($i+1) != $_SESSION['countProjects']){
/* -- OR operation is performed only up to the last but one selected
project --
*/
$projectClause.=" OR";
}
}
}
$projectClause.=" )";
/* -- Append the projectClause to the general query -- */
$query.=$projectClause;
/* -- To maintain selected sources while selecting other facets -- */
if(count($_SESSION['qsource']) != 0){
$union=" UNION";
for ($i=0;$i < count($_SESSION['qsource']);$i++){
$union.=" SELECT DISTINCT source FROM pages WHERE source='".
$_SESSION['qsource'][$i
]."'";
if(($i+1) != count($_SESSION['qsource']))
$union.=" UNION";
}
$query.=$union;
}
/* -- Prints out the query for the testing purpose -- */
// echo $query."<br>";
$userSources = mysql_query($query);
$j=0;
```

```
while($sources=mysql_fetch_array($userSources,MYSQL_BOTH)) {
$userSource = str_replace(' ','@',$sources['source']);
$sourceName=$sources['source'];
/* -- Avoids displaying source 'About Blank' -- */
if($sourceName != ""){
/* -- Creates checkboxes for each cource and fires an onclick event to
call a
function redraw() -- */
$str = "<input type=checkbox name='source".$j++. "' value=$userSource
id=
$userSource onclick=";
$str .= "redraw(\"";
$str .= $userSource;
$str .= "\")";
for($k=0; $k< count($_SESSION['qsource']); $k++){
if($userSource==$_SESSION['qsource'][$k])
$str .= " checked='true'";
}
$str .= " />";
echo $str;
echo $sources['source'];
echo "<br/>";
}
}
?>
```

5. Code for redrawResultsList.php

```
<?php
$username=$_POST['username'];
session_start();
require ("connection.php");
include ("checkedFacets.php");
$user=mysql_query ("select userid from users where
username='$username';");
$users=mysql_fetch_array($user, MYSQL_BOTH);
$userid=$users['userid'];
$_SESSION['qproj'] = extractCheckedProjects($_POST);
$_SESSION['qcollab'] = extractCheckedCollaborators($_POST);
$_SESSION['qsource'] = extractCheckedSources($_POST);
/* -- General query structure -- */
if(count($_SESSION['qproj']) != 0 || count($_SESSION['qcollab']) != 0
|| count($_SESSION[
'qsource']) != 0){
$query = "SELECT pages.date, projects.projectid, projects.title pTitle,
users.username,
pages.source, pages.pageid, pages.url, pages.title FROM projects,
users, pages
WHERE pages.userid=users.userid AND
pages.projectid=projects.projectid";
}
/* -- Where clause for the selected collaborators -- */
if(count($_SESSION['qcollab']) != 0){
$collabClause = " AND (";
for($i=0; $i<count($_SESSION['qcollab']); $i++){
$collabClause.=" users.userid =".$_SESSION['qcollab'][$i];
if(($i+1) != count($_SESSION['qcollab']))
$collabClause.=" OR";
}
$collabClause.=" )";
$query.=$collabClause;
}
/* -- Where clause for the selected sources -- */
if(count($_SESSION['qsource']) != 0){
$sourceClause = " AND (";
for($i=0; $i<count($_SESSION['qsource']); $i++){
$sourceClause.=" pages.source ='".$_SESSION['qsource'][$i] ."'";
if(($i+1) != count($_SESSION['qsource']))
$sourceClause.=" OR";
}
$sourceClause.=" )";
$query.=$sourceClause;
}
/* -- Where clause for projects -- */
$projectClause=" AND (";
/* -- When projects are selected -- */
if(count($_SESSION['qproj']) != 0){
for($i=0; $i<count($_SESSION['qproj']); $i++){
$projectClause.=" projects.projectid=" . $_SESSION['qproj'][$i];
if(($i+1) != count($_SESSION['qproj']))
$projectClause.=" OR";
}
}
/* -- When no project is selected -- */
else{
for($i=0; $i<$_SESSION['countProjects']; $i++){
$projectClause.=" projects.projectid=".$_SESSION['projects'][$i];
if(($i+1) != $_SESSION['countProjects'])
$projectClause.=" OR";
}
}
$projectClause.=" )";
$query.=$projectClause;
// echo $query;
$list=mysql_query($query);
$resultNum = mysql_num_rows($list);
/* -- Display the table structure only if the query has any results --
*/
if($resultNum > 0){
echo "<table>
<tr style='text-align:center; width:100%'>
<th style='width:5%; text-align:center'> </th>
<th style='width:18%; text-align:center'>Project</th>
<th style='width:15%; text-align:center'>User Name</th>
<th style='width:12%; text-align:center'>Source</th>
<th style='width:40%; text-align:center'>Page Title</th>
<th style='width:10%; text-align:center'>Date</th>
</tr>";
}
/* -- Display message that there are no results -- */
```

```
elseif(count($_SESSION['qproj']) == 0 && count($_SESSION['qcollab']) ==
0 && count($_SESSION
['qsource']) == 0){
echo "<div style='font-size:16px; text-align:center'>No facets
selected</div>";
}
else{
echo "<div style='font-size:16px; text-align:center'>No results fetched
for the
selected facet(s)</div>";
}
$iCount=1;
while ($displayList = mysql_fetch_array($list, MYSQL_BOTH)) {
$url = $displayList['url'];
$url = str_replace('&', '&amp;', $url);
// $pageid = $displayList['pageid'];
if($iCount%2==0)
$color=even;
else
$color=odd;
echo "<tr class='$color'>";
echo "<td>$iCount</td><td>";
echo $displayList['pTitle'];
echo "</td><td>";
echo $displayList['username'];
echo "</td><td>";
echo $displayList['source'];
echo "</td><td><a target='_blank' href='";
echo $url;
echo "'>";
echo $displayList['title'];
echo "</a></td><td>";
echo $displayList['date'];
echo "</td></tr>";
$iCount++;
}
echo"</table>";
?>
```

6. Code for redrawResultsGraph.php

```
<?php
$username=$_POST['username'];
session_start();
$username=$_SESSION['username'];
require ("connection.php");
include ("checkedFacets.php");
$user=mysql_query ("select userid from users where
username='$username';");
$users=mysql_fetch_array($user, MYSQL_BOTH);
$userid=$users['userid'];
if(count($_SESSION['qproj']) != 0 || count($_SESSION['qcollab']) != 0
|| count($_SESSION[
'qsource']) != 0){
```

```
$query = "SELECT pages.date, projects.projectid, projects.title pTitle,
users.username,
pages.source, pages.pageid, pages.url, pages.title
FROM projects, users, pages WHERE pages.userid=users.userid AND
pages.projectid=projects.projectid";
}
/* -- Where clause for the selected collaborators -- */
if(count($_SESSION['qcollab']) != 0){
$collabClause = " AND (";
for($i=0; $i<count($_SESSION['qcollab']); $i++){
$collabClause.=" users.userid =".$_SESSION['qcollab'][$i];
if(($i+1) != count($_SESSION['qcollab']))
$collabClause.=" OR";
}
$collabClause.=" )";
$query.=$collabClause;
}
/* -- Where clause for the selected sources -- */
if(count($_SESSION['qsource']) != 0){
$sourceClause = " AND (";
for($i=0; $i<count($_SESSION['qsource']); $i++){
$sourceClause.=" pages.source ='".$_SESSION['qsource'][$i] ."'";
if(($i+1) != count($_SESSION['qsource']))
$sourceClause.=" OR";
}
$sourceClause.=" )";
$query.=$sourceClause;
}
/* -- Where clause for projects -- */
$projectClause=" AND (";
/* -- When projects are selected -- */
if(count($_SESSION['qproj']) != 0){
for($i=0; $i<count($_SESSION['qproj']); $i++){
$projectClause.=" projects.projectid=" . $_SESSION['qproj'][$i];
if(($i+1) != count($_SESSION['qproj']))
$projectClause.=" OR";
}
}
/* -- When no project is selected -- */
else{
for($i=0; $i<$_SESSION['countProjects']; $i++){
$projectClause.=" projects.projectid=".$_SESSION['projects'][$i];
if(($i+1) != $_SESSION['countProjects'])
$projectClause.=" OR";
}
}
$projectClause.=" )";
$query.=$projectClause;
$query.=" ORDER BY date ASC";
// echo $query;
$graphQuery = mysql_query($query);
$numOfResults = mysql_num_rows($graphQuery);
$fileName = $username.".svg";
$myFile = $fileName;
$handle = fopen($fileName, 'w+');
if($handle){
if(!fwrite($handle, '<?xml version="1.0"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
"http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">
<svg xmlns="http://www.w3.org/2000/svg"
xmlns:xlink="http://www.w3.org/1999/xlink">'
)
)
die("couldn't write to file.");
}
/* Javascript functions inside svg file */
fwrite($handle, '<script type="text/javascript">
function displayRect(id)
{
if(!window.RectDisplayed){
window.RectDisplayed=true;
var x = id;
var smallRect = "small_" + x;
var bigRect = "big_" + x;
var closeRect = "closeRect_" + x;
var closeText = "closeText_" + x;
var data = "data_" + x;
var line = "line_" + x;
var rectSmall=document.getElementById(smallRect);
var rectBig=document.getElementById(bigRect);
rectBig.setAttribute("display","inline");
var rectClose=document.getElementById(closeRect);
rectClose.setAttribute("display","inline");
var textClose=document.getElementById(closeText);
textClose.setAttribute("display","inline");
var connectingLine=document.getElementById(line);
connectingLine.setAttribute("display","inline");
var dataText=document.getElementById(data);
dataText.setAttribute("display","inline");
rectSmall.setAttribute("width","13");
rectSmall.setAttribute("height","15");
}
else
alert("Please close the open result window first...");
}
function hideDisplay(id)
{
window.RectDisplayed=false;
var x = id;
var smallRect = "small_" + x;
var bigRect = "big_" + x;
var closeRect = "closeRect_" + x;
var closeText = "closeText_" + x;
var data = "data_" + x;
var line = "line_" + x;
var rectSmall=document.getElementById(smallRect);
var rectBig=document.getElementById(bigRect);
rectBig.setAttribute("display","none");
var rectClose=document.getElementById(closeRect);
rectClose.setAttribute("display","none");
var textClose=document.getElementById(closeText);
textClose.setAttribute("display","none");
var connectingLine=document.getElementById(line);
connectingLine.setAttribute("display","none");
```

```
var dataText=document.getElementById(data);
dataText.setAttribute("display","none");
rectSmall.setAttribute("width","10");
rectSmall.setAttribute("height","10");
}
function goToTheLink(link)
{
window.open(link);
}
</script></svg>');
$xml = file_get_contents($fileName);
$parser = new SimpleXMLElement($xml);
$x1=-20;
$y1=407;
$uniqueID = array();
$previousDate="";
if(count($_SESSION['qproj']) == 0 && count($_SESSION['qcollab']) == 0
&& count($_SESSION[
'qsource']) == 0){
$noResultsText = $parser->addChild('text','No facets selected');
$noResultsText->addAttribute('x','350');
$noResultsText->addAttribute('y','20');
$noResultsText->addAttribute('style','font-size:17px');
}
elseif($numOfResults == 0){
$noResultsText = $parser->addChild('text','No results fetched for the
selected facet(s)'
);
$noResultsText->addAttribute('x','320');
$noResultsText->addAttribute('y','20');
$noResultsText->addAttribute('style','font-size:17px');
}
while ($results = mysql_fetch_array($graphQuery, MYSQL_BOTH)) {
$id = uniqid ();
$uniqueID[] = $id;
if($previousDate == $results['date']){
$y1=$y1-20;
}
else{
$x1=$x1+90;
$y1=407;
$date = $results['date'];
$text = $parser->addChild('text',$date);
$text->addAttribute('x',$x1);
$text->addAttribute('y','438');
}
$colorCode =
substr(sha1($results['username']),strlen(sha1($results['username']))-
7,3);
if($y1 < 20){
$x1 = $x1+20;
$y1 = 407;
}
$smallRect = $parser->addChild('rect');
$smallRect->addAttribute('x',$x1);
$smallRect->addAttribute('y',$y1);
$smallRect->addAttribute('width','10');
```

```
$smallRect->addAttribute('height','10');
$smallRect->addAttribute('id','small_'.$id);
$smallRect->addAttribute('style','cursor:pointer; fill:#'.$colorCode);
$smallRect->addAttribute('onclick','displayRect("'.$id.'")');
$previousDate=$results['date'];
}
$x=-20;
$y=407;
$flag=0;
$count=0;
$graphQuery = mysql_query($query);
$previousDate="";
while ($results = mysql_fetch_array($graphQuery, MYSQL_BOTH)) {
$id = $uniqueID[$count++];
$bigRect = $parser->addChild('rect');
$connectingLine = $parser->addChild('line');
if($previousDate == $results['date']){
$y=$y-20;
}
else{
$x=$x+90;
$y=407;
$flag++;
}
if($y < 20){
$x = $x+20;
$y = 407;
}
if($y < 250){
if($y > 89)
$yConnectingLine1 = $y;
else
$yConnectingLine1 = $y+14;
$yConnectingLine2 = 100;
}
else{
$yConnectingLine1 = $y;
$yConnectingLine2 = 250;
}
if($flag < 4){
$xBigRect = $x+150;
$xConnectingLine1 = $x+13;
$xConnectingLine2 = $x+150;
$closeRectX = $x+150+200-12;
$closeTextX = $x+150+200-11;
$dataX = $x+150+10;
}
else{
$xBigRect = $x-250;
$xConnectingLine1 = $x;
$xConnectingLine2 = $x-50;
$closeRectX = $x-250+200-12;
$closeTextX = $x-250+200-11;
$dataX = $x-250+10;
}
$bigRect->addAttribute('x',$xBigRect);
$bigRect->addAttribute('y','100');
```

```
$bigRect->addAttribute('width','200');
$bigRect->addAttribute('height','150');
$bigRect->addAttribute('id','big_'.$id);
$bigRect->addAttribute('style',
'fill:#00cc66;stroke-width:1;stroke:rgb(0,0,0);fill-
opacity:1;opacity:1;z-index:10');
$bigRect->addAttribute('display','none');
$bigRect->addAttribute('z-index','9999');
$connectingLine->addAttribute('y1',$yConnectingLine1);
$connectingLine->addAttribute('x1',$xConnectingLine1);
$connectingLine->addAttribute('x2',$xConnectingLine2);
$connectingLine->addAttribute('y2',$yConnectingLine2);
$connectingLine->addAttribute('style','stroke:rgb(99,99,99)');
$connectingLine->addAttribute('id','line_'.$id);
$connectingLine->addAttribute('display','none');
$connectingLine->addAttribute('z-index','1');
$closeRect = $parser->addChild('rect');
$closeRect->addAttribute('x',$closeRectX);
$closeRect->addAttribute('y','100');
$closeRect->addAttribute('width','12');
$closeRect->addAttribute('height','12');
$closeRect->AddAttribute('id','closeRect_'.$id);
$closeRect->addAttribute('display','none');
$closeRect->addAttribute('style',
'fill:rgb(255,255,255);stroke-width:1;stroke:rgb(0,0,0)');
$closeText = $parser->addChild('text','X');
$closeText->addAttribute('x',$closeTextX);
$closeText->addAttribute('y','112');
$closeText->AddAttribute('id','closeText_'.$id);
$closeText->addAttribute('display','none');
$closeText->addAttribute('onclick','hideDisplay("'.$id.'")');
$closeText->addAttribute('cursor','pointer');
$metadata = $parser->addChild('text','Result Details:');
$metadata->addAttribute('text-decoration','underline');
$metadata->addAttribute('x',$dataX);
$metadata->addAttribute('y','120');
$metadata->addAttribute('font-weight','900');
$metadata->addAttribute('font-size','12');
$metadata->addAttribute('id','data_'.$id);
$metadata->addAttribute('display','none');
$tspan = $metadata->addChild('tspan',"Project ID:
".$results['projectid']);
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1.5em');
$tspan->addAttribute('font-weight','100');
$tspan = $metadata->addChild('tspan',"Project: ".$results['pTitle']);
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
$tspan = $metadata->addChild('tspan',"Source: ".$results['source']);
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
$tspan = $metadata->addChild('tspan',"Creator: ".$results['username']);
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
```

```
$tspan = $metadata->addChild('tspan',"Page ID: ".$results['pageid']);
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
$tspan=$metadata->addChild('tspan',"Page Title: ");
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
$trimmedTitle=substr($results['title'],0,20);
if($trimmedTitle==$results['title'])
$tspan=$metadata->addChild('tspan',$trimmedTitle);
else
$tspan=$metadata->addChild('tspan',$trimmedTitle."...");
$tspan->addAttribute('dx','0.7em');
$tspan->addAttribute('font-weight','100');
$tspan = $metadata->addChild('tspan',"URL:");
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1em');
$tspan->addAttribute('font-weight','100');
$trimmedURL=substr($results['url'],0,27);
if($trimmedURL==$results['url'])
$tspan = $metadata->addChild('tspan',$trimmedURL);
else
$tspan = $metadata->addChild('tspan',$trimmedURL);
$tspan->addAttribute('dx','0.7em');
$tspan->addAttribute('text-decoration','underline');
$tspan->addAttribute('cursor','pointer');
$tspan->addAttribute('style','fill:rgb(0,0,255)');
$tspan->addAttribute('onclick','goToTheLink("'.$results['url'].'")');
if($trimmedURL != $results['url']){
$remainingURL=substr($results['url'],28,30);
if(strlen($results['url']) < 59)
$tspan = $metadata->addChild('tspan',$remainingURL);
else
$tspan = $metadata->addChild('tspan',$remainingURL."...");
$tspan->addAttribute('x',$dataX);
$tspan->addAttribute('dy','1.0em');
$tspan->addAttribute('text-decoration','underline');
$tspan->addAttribute('cursor','pointer');
$tspan->addAttribute('style','fill:rgb(0,0,255)');
$tspan->addAttribute('onclick','goToTheLink("'.$results['url'].'")');
}
$previousDate=$results['date'];
}
$width = $x1+100;
if($width < 892)
$width = 892;
echo $width;
/* Plot X and Y Axes */
$xAxis = $parser->addChild('line');
$xAxis->addAttribute('x1','10');
$xAxis->addAttribute('y1','420');
$xAxis->addAttribute('x2','100%');
$xAxis->addAttribute('y2','420');
$xAxis->addAttribute('style','stroke:rgb(99,99,99)');
$yAxis = $parser->addChild('line');
$yAxis->addAttribute('x1','40');
```

```
$yAxis->addAttribute('y1','440');
$yAxis->addAttribute('x2','40');
$yAxis->addAttribute('y2','2%');
$yAxis->addAttribute('style','stroke:rgb(99,99,99)');
/* Plot Y-axis scale */
$y=1;
for($count=415;$count>30;$count-=20){
$yCount = $parser->addChild('text',$y);
$yCount->addAttribute(x,'20');
$yCount->addAttribute(y,$count);
$y++;
}
$myFile = $fileName;
chmod ($fileName,0777);
$fh = fopen($myFile, 'w') or die("can't open file");
fwrite($fh, $parser->asXML());
fclose($fh);
Header('Cache-Control: no-cache');
Header('Pragma: no-cache');
?>
```

7. Code for checkedFacets.php

```
<?php
function extractCheckedProjects($postProj)
{
$j=0;
/* -- Runs the loop to store current element in the array into $current
variable -- */
while($current = current($postProj))
{
/* -- Stores the key of the array into the variable $key -- */
$key = key($postProj);
/* -- stores the current element of the array into an array $projArray
when the key
of the array has word 'proj' -- */
if (strstr($key,'proj') != false)
$projArray[$j++] = $current;
next($postProj);
}
return $projArray;
}
function extractCheckedCollaborators($postCollab)
{
$j=0;
while($current = current($postCollab))
{
$key = key($postCollab);
if (strstr($key,'collab') != false)
$collabArray[$j++] = $current;
next($postCollab);
}
return $collabArray;
}
function extractCheckedSources($postSources)
```

```
{
$j=0;
while($current = current($postSources))
{
$key = key($postSources);
if (strstr($key,'source') != false)
$sourceArray[$j++] = $current;
next($postSources);
}
return $sourceArray;
}
?>
```