Developing Apps for the BlackBerry Smartphone

Lab # 4

Getting Started with Ajax and jQuery – Part 2

The objective of this lab is to review some of the concepts in HTML and CSS for creating WebWorks application for the BlackBerry Smartphone. In this lab, we'll be dealing with the interface of the application. Before attempting this lab, please be sure to download and install the BlackBerry WebWorks SDK for Smartphones available at https://bdsc.webapps.blackberry.com/html5/download/sdk. Make sure you that you have Java Software Development Kit installed and configured on your computer. Please also install the Ripple Emulator available at: https://bdsc.webapps.blackberry.com/html5/download/ripple. The Ripple emulator is a mobile environment emulator that is custom-tailored for mobile HTML5 application development and testing. You do not need to worry about signing your application as we'll be testing it on the emulator. Instructions on how to setup and start using the emulator can be found at: https://bdsc.webapps.blackberry.com/html5/documentation/ww_getting_started/getting_started_with_ripple_1866966_11.html. This lab also assumes that you have knowledge of basic HTML and CSS.

Continuing Communicating with External Data Sources in an HTML application:

- Use your completed code from Lab 3.
- Open index.html in your favorite text editor.
- Open script.js in your favorite text editor as well.
- We'll continue communicating directly with Google in order to obtain information about the author which the user entered in the search box. In the previous lab, we've started the process, and now we'll continue it.
- Let's start by coding the function that will get called if there are less than 100 papers. We called this function 'doCallForLessThan100Papers' in the previous lab. Find that function in your code.
- Start by creating a variable called 'url' which will hold the URL we need to parse the results from. Your 'url' variable will use the 'resultquery' variable that was sent to the function, as well as the global 'ret_results' variable. Remember: 'resultquery' is the user's input formatted to be used in the URL, and 'ret_results' is the global variable which holds the number of results Google will display per page.
- Create the following 'url' variable

```
var url =
"http://scholar.google.ca/scholar?q="+resultquery+"&num="+ret_results+"&hl=en&btnG
=Search&as_sdt=1%2C5&as_sdtp=on";
```

- Next we'll create another jQuery get function to retrieve the HTML page. Start with the following outline of the 'get' function:

```
$.get(url, function(data)
{
        //Your code will go in here
})
```

```
.error(function()
{
        alert("An error occured");
        return;
});
```

- Again, the jQuery ‘get’ function will connect to the URL sent in the variable ‘url’ and once the data retrieval process is complete, the result will be in the variable ‘data’.
- The first step inside the get function is to check if data is equal to null. If it is, we should alert the user that there is no data, set the style of the loading icon which was triggered when the search started to ‘none’, and return out of the function.

```
if(data==null)
{
        alert("There is no data");
        document.getElementById("loading").style.display="none";
        return;
}
```

- After we check if the data isn’t null, we’ll need to perform some actions on the data. We’ll first need to get the number of citations for each paper on the page:
- We’ll create a function called ‘getCitationCount’ for this, followed by getting the range of years of papers (done with the ‘getYearInformation’ function), followed by calculating the total number of citations (done with the ‘totalCites’ function we’ll create). Let’s add the call to the function, and deal with implementing them afterwards.
- Since this function only gets called if we have one page of results, we’ll just need to use index 0 in the ‘citesPages’ array. Remember this array holds the total citations on each page. Add a call to the ‘getCitationCount’ function which takes in ‘data’ as an argument, and assign the result to ‘citesPages[0]’. Afterwards, call the function for ‘getYearInformation’ again sending data as an argument to the function, and finally calling the ‘totalCites’ function with no arguments. Your ‘doCallForLessThan100Papers’ function should now look like the following:

```
function doCallForLessThan100Papers(resultquery)
{
        var url =
        "http://scholar.google.ca/scholar?q="+resultquery+"&num="+ret_results+"&hl=e
        n&btnG=Search&as_sdt=1%2C5&as_sdtp=on";

        $.get(url, function(data)
        {
                if(data==null)
                {
                        alert("There is no data");
                        document.getElementById("loading").
                        style.display="none";
```

```
                    return;
                }
                citePages[0] = getCitationCount(data);
            getYearInformation(data);
                totalCites();
            })
            .error(function()
            {
            alert("An error occured");
            return;
            });
}
```

- Now, add the following function for 'getCitationCount' in your code.

```
function getCitationCount(responseText)
{
        if (responseText == null)
        {
                alert("There is no data.");
        document.getElementById("loading").
                style.display="none";
                return;
        }

        var cite_exists = 1;
        var resultPositionPost = 0;
        var citeArray = new Array();

        for(var i = 0; cite_exists > 0; i++)
        {
            cite_exists = responseText.indexOf("\">Cited by", resultPositionPost + 1);
                if(cite_exists == -1)
            {
                }
            else
            {
                  var post = '</a>';
                    var resultPositionPre = cite_exists + '\">Cited by'.length + 1;
                    resultPositionPost = responseText.indexOf(post, resultPositionPre);
                    var resultLength = resultPositionPost - resultPositionPre;
                    var tmp_string = responseText.substr(resultPositionPre,
                    resultLength);
                  citeArray[i] = tmp_string;
                  publications++;
                }
        }
        return citeArray;
}
```

- The ‘getCitationCount’ function will first check to make sure the text sent is not null. If it is, it will alert the user and return out of the function. Otherwise it will create variables for ‘cite_exists’, ‘resultPositionPost’ and ‘citeArray’ and initialize them. The ‘cite_exists’ will be used to store the location of the String ‘Cited by’ in the text sent to the function. If you look at the source code of a Google Scholar search result in your internet browser, you’ll see that the text ‘Cited by’ is always followed by a number, which is the number of citations for each article.
- ‘resultPostPosition’ holds the location of the ‘’ HTML tag, which is always found after the number of citations in the HTML source code. The array ‘citeArray’ holds the number of citations for each of the articles returned from the query.
- The for-loop continues looping while ‘cite_exists’ is greater than 0, which also means there is more text that matches the String ‘Cited by’ in the results.
- The first step in the for-loop is to get the location of the text ‘Cited by’. If the text is found (meaning that ‘cite_exists’ doesn’t equal -1), then we search for the text ‘’ starting from the position where we found ‘Cited by’.
- We then get the length of the citation String by subtracting the beginning and end location, followed by using the ‘substring’ method to extract the String (the number of citations for that article) that we need. We then store this number into the ‘citeArray’ array at location ‘i’ in the for-loop. The entire process is repeated until we go through all of the publications on the page (meaning we can no longer find ‘Cited by’ on the page).
- The next function we need to add is the ‘getYearInformation’ function.

```
function getYearInformation(responseText)
{
        if (responseText == null)
        {
                alert("There is no data.");
        document.getElementById("loading").
                style.display="none";
                return;
        }

        var year_string_exists = 1;
        var resultPositionPost = 0;

        for(var i = 0; year_string_exists > 0; i++)
        {
            year_string_exists = responseText.indexOf('class= "gs_a "',
            resultPositionPost + 1);
                if(year_string_exists == -1)
                {
                }
                else
                {
                        var post = '</div>';
                        var resultPositionPre = year_string_exists + 'class= "gs_a
                        "'.length + 1;
                        resultPositionPost = responseText.indexOf(post,
                        resultPositionPre);
```

```
                    var smallstr = responseText.substring(resultPositionPre,
                    resultPositionPost);

                    var re = /(19|20)\d\d/;
                    var m = re.exec(smallstr);


                    if (m == null)
                    {
                    }
                    else
                    {
                            if(m[0]< minyear && m[0]>1950 && m[0]<2015)
                            {
                                    minyear = m[0];
                            }
                            if(m[0]>maxyear && m[0]<2015)
                            {
                                    maxyear = m[0];
                            }
                    }
            }
    }
}
```

- The 'getYearInformation' function gets the publication year range of all the articles returned in the query. The process is somewhat similar to the 'getCitationCount' function, except the code searches for different flags. The function will first search for 'class=gs_a' in the HTML source code. If that is found, the function will search for the closing span tag ''. Between these two found locations, there will be some text with the date the article was published, for example '…, QH Mahmoud - … of the 17th international conference on …, 2008 - portal.acm.org'. To extract the date, we just need to employ regular expressions which will extract any string that matches a year pattern. In the function we will use the following code:

```
var re = /(19|20)\d\d/;
var m = re.exec(smallstr);
```

- This expression will extract any number that starts with '19' or '20' and is followed by 2 digits. This represents any year from 1900 to 2099 which is good enough for our purposes. We used the 'exec' method on the text we extracted to get the publication year for each article. Finally, we need to save the minimum and maximum years so that we can calculate the years of publications. That is done in the IF statement following the regular expression.
- Now let's add the 'totalCites' function. This function is always called at the very end of the program to add up all the number of citations found on the page, perform some calculations, and display the results to the user. This function will first go through all the elements in the 'citePages' array, store them into the 'citeArray' array, then add up every single number within each location of the 'citeArray'. Remember, we stored the citation

numbers we parsed from the HTML in 'citePages' array in the 'doCallForLessThan100Papers' and 'getCitationCount' function.

- This code goes thru this first step in the function

```
function totalCites()
{
     document.getElementById("loading").style.display="none";
       // Calculate the total number of citations from all fetched pages
   var total_citations = 0;

   for(var i = 0; i < citePages.length; i++)
     {
     var citeArray = citePages[i];
    for(var j = 0; j < citeArray.length; j++)
        {
     // Convert the string type into a numerical type
     total_citations += citeArray[j]*1;
    }
 }
//More to be explained...
 }
```

- After we sum the number of citations for the author, some calculation need to be performed to gather statistics about the author. The citations per paper can be calculated by dividing the total number of citations by the number of papers. The years of publications can be calculated by subtracting the 'maxyear' variable from the 'minyear' variable, and adding 1 to the result. Citations for year can be found by dividing the total number of citations by the number of years of publications.
- The final statistic that is calculated in the program is h-index. This is a very important calculation as it gives a number which gives a good representation of the quality of the author you searched for. H-index works as follows:
    - Sort the number of citations from all papers. Start counting the papers from 1 to *count*. If the number of citations for paper *count* is greater than or equal to *count*, then assign the number of citations for that paper to a temporary variable (temp). If there is ever a paper count that has fewer citations than *count*, then break the loop. The number that is currently stored in temp is your h-index.
- The code for these calculations can be found below. Add them to the 'totalCites' function.

```
var citeperpaper = total_citations/numOfPapers;
citeperpaper = Math.round(citeperpaper*100)/100;
var years = ((maxyear-minyear)+1);
var citeperyear = total_citations/years;
citeperyear = Math.round(citeperyear*100)/100;
var hindex = h_index();
```

- You'll also need to add a function for h-index which can be found. Be sure to include the 'sortNumber' function as well since the 'h_index' function utilizes it.

```
function h_index()
{
   var hArray = new Array();
   var x = 0;
   for(var i = 0; i < citePages.length; i++){
      var citeArray = citePages[i];
            for(var j = 0; j < citeArray.length; j++){
               //Convert the string type into a numerical type
               hArray[x++] = citeArray[j]*1;
      }
   }
   hArray.sort(sortNumber);

   var hindex = 0;
   for(var i = 0; i < hArray.length; i++){
      if(hArray[i]>=(i+1))
      {
          hindex = (i+1);
      }
      else
      {
          break;
      }
   }
   return hindex;
}

function sortNumber(a,b)
{
   return b - a;
}
```

- The last piece that needs to be added into the 'totalCites' function is the code for displaying the results to the user. To do that, we'll need to use DOM to replace the text in the 'results' DIV with the calculated values. Before we do that, we'll first have to preform one pre-check. We need to check if the global 'years' variable is equal to -9999. If it is, this would mean that there was no year information on the page, and 'minyear' and 'maxyear' would have been their default variable in the calculations explained above (remember they are assigned 9000 and -1000 respectively initially). If 'years' is equal to -9999, we can just reset the 'years' variable to '-' before we show the user to make things look more professional. Add the following code to the 'totalCites' function which will create a table on the screen and display everything to the user.

```
if(years==-9999){years="-";}
var html = "<table id='resulttable'><tr><td>Total Papers: </td> <td
id='tableright'>"+numOfPapers+"</td></tr>";
html += "<tr><td id='tableleft'>Total Citations: </td> <td
id='tableright'>"+total_citations+"</td></tr>";
html += "<tr><td id='tableleft'>Citations per Paper: </td> <td
id='tableright'>"+citeperpaper+"</td></tr>";
```

```
html += "<tr><td id='tableleft'>Cited Publications: </td> <td
id='tableright'>"+publications+"</td></tr>";
html += "<tr><td id='tableleft'>h-index: </td> <td
id='tableright'>"+hindex+"</td></tr>";
  html += "<tr><td id='tableleft'>Years of Publications: </td> <td
id='tableright'>"+years+"</td></tr>";
html += "<tr><td id='tableleft'>Citations per Year: </td> <td
id='tableright'>"+citeperyear+"</td></tr></table>";
html += "<br/><br/><div id='viewpapersbutton'><input type='button'
onclick='openPage();' value='View Papers by the Author'/></div>";

document.getElementById("results").innerHTML = html;
```

- We'll also need to add some CSS code for the styling of the table. Add the following CSS code to the styles.css file to format the table properly. You should be familiar with all the CSS code that being showed. If you're unsure, refer to previous labs where CSS was covered.

```
#resulttable
{
        padding-top: 40px;
        width: 400px;
        padding-left: 5px;
        padding-right: 5px;
}

#tableright
{
        text-align: left;
        font-size: 12px;
        color: #07334e;
}

#tableleft
{
        text-align: left;
        font-size: 12px;

}
```

- We're almost finished this function. You may have noticed the following line:

```
html += "<br/><br/><div id='viewpapersbutton'><input type='button'
onclick='openPage();' value='View Papers by the Author'/></div>";
```

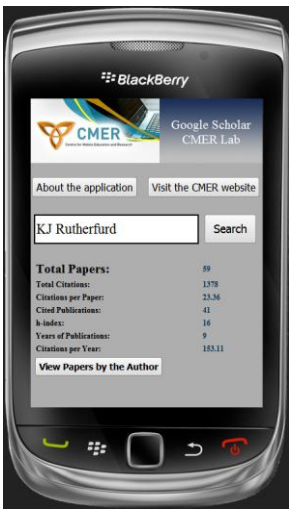
This line actually creates another DIV container, with a button inside. This button will be used to open the browser so that the user can see the results on the Google Scholar page. Let's start implementing this function after adding the CSS for this button.

```
#viewpapersbutton
{
        padding-top: 0px;
        padding-left: 5px;
        width: 80px;
        height: 45px;
        font-size: 15px;
}
```

- The 'openPage' function will seem similar to a function we previously implemented (the 'openCMERWebsite' function). We'll be performing the same action, but with a different URL. You'll also notice the URL variable we're using in this function is the same URL variable we've been saving globally in the 'getScholarResults' function. Add the following function into your program:

```
function openPage()
{
        var args = new blackberry.invoke.BrowserArguments(openpageurl);
        blackberry.invoke.invoke(blackberry.invoke.APP_BROWSER, args);
}
```

- Now would be a good time to test everything we've done in the application so far, and take a look at a result from a real query. Load the application into the Ripple emulator. Type in the query "KJ Rutherfurd" and press Search. You should get some results back for this query, as the results will have less than 100 papers. You should now see results similar to the following:



- Also try pressing the 'View Papers by the Author' button, and make sure that the browser opens and brings you to the Google Scholar results. If everything works, that's great news. If not, re-trace your steps throughout the lab and make sure there aren't any mistakes in your code.

- You may remember in lab 3 we added a call to the 'setTimeout' which calls a function 'wait' after 3000 milliseconds. The function call looked like:

  ```
  setTimeout("wait()", 3000);
  ```

- Now you need to implement the 'wait' function because it will be used in the methods you implement afterwards. The 'wait' function should check if the variable 'done' is equal to true or not. If it is not equal to true, the 'wait' function should be called again after 3000 milliseconds again using the 'setTimeout' function. If 'done' is equal to true, then the 'totalCites' function should be called. Your 'wait' function should look something like the following:

  ```
  function wait()
  {
    if(done != true)
    {
      setTimeout("wait()", 3000);
    }
    else
    {
      totalCites();
    }
    return;

  }
  ```

- Another helper function we'll need to incorporate in the program before we implement the final methods is for creating the Google Scholar URL for queries with more than one page of results. Call this function 'createURL'. The function should accept two arguments. The first is the beginning result number (can either be 0, 100, 200, 300…1000). Remember that we return 100 results per page, so the beginning result can only start with one of these numbers. The second argument is the original query formatted for using with Google Scholar that was created in an earlier lab. The 'createURL' function should look like the following:

  ```
  function createURL(begin, rq)
  {
          if(begin == 0)
          {
                  return
                  "http://scholar.google.ca/scholar?q="+rq+"&num="+ret_results+"&hl=e
                  n&btnG=Search&as_sdt=1%2C5&as_sdtp=on&start=0";
          }
          if(begin == 100)
          {
                  return
                  "http://scholar.google.ca/scholar?q="+rq+"&num="+ret_results+"&hl=e
                  n&btnG=Search&as_sdt=1%2C5&as_sdtp=on&start=100";
          }
          if(begin == 200)
  ```

```
        {
                return
                "http://scholar.google.ca/scholar?q="+rq+"&num="+ret_results+"&hl=e
                n&btnG=Search&as_sdt=1%2C5&as_sdtp=on&start=200";
        }
        //Code should be between here to check for 300, 400, 500, etc.
        if(begin == 1000)
        {
                return
                "http://scholar.google.ca/scholar?q="+rq+"&num="+ret_results+"&hl=e
                n&btnG=Search&as_sdt=1%2C5&as_sdtp=on&start=1000";
        }
        return "";

}
```

- Notice the only difference in the return value of the IF statements is at the end of the URL where the 'start' value is changed depending on the 'begin' value sent to the function. Add this function into your code.
- Now it is time to implement the last two remaining functions, 'doCallForPagesLessThan10' and 'doCallForPagesEqualTo10'. Start with the 'doCallForPagesLessThan10' function.
- If you remember in the 'getScholarResultsPart2' function, if the number of pages in the results is less than 10, we set the global 'currentPage' variable to 0, and called the 'doCallForPagesLessThan10' function. The first thing we need to do in this function is check if 'currentPage' is less than or equal to 'pages'. 'pages' is the total number of pages returned in the query, so while we're still on a page that exists in the results, we'll need to do some work. If 'currentPage' is greater than 'pages', we should set the global variable done to true. Remember that if 'done' is equal to true, the 'wait' function will call the 'totalCites' function to complete the search.
- If 'currentPage' is less than or equal to 'pages', we should create a variable called 'begin' and set the value equal to 'currentPage * 100'. We use this variable to call the 'createURL' function we defined earlier.
- Call the function 'createURL' with the 'begin' variable as the first argument and 'resultquery' as the second argument. The 'createURL' function will return the URL we need to fetch from Google Scholar.
- Now it is time to use the jQuery 'get' function again similar to what was done before. You should also check to make sure the result returned is not null. If it is, you should again alert the user 'There was no data', hide the loading icon, and return out of the function. Your 'get' function call so far should look like the following:

```
$.get(url, function(data) {
        if(data==null)
        {
                alert("There is no data");
        document.getElementById("loading").
                style.display="none";
                return;
        }
        //Parse result from Google Scholar
```

```
        })
        .error(function() { alert("There was an error"); return;
});
```

- Now you'll need to call the functions you created earlier to get the number of citations as well as the minimum and maximum years for the returned articles on the page.
- After the if statement where you checked if 'data' is equal it null, make a call to 'getCitationCount' while sending 'data' as an argument to that function, and have the return value assigned to the 'citePages' array at index 'counter++'. This will allow the counter variable to increase each time we add an element to the 'citePages' array to prevent elements from being overwritten. Your function call and assignment should look like the following:

```
citePages[counter++] = getCitationCount(data);
```

- Afterwards, call the 'getYearInformation' function again sending 'data' as the argument as follows:

```
getYearInformation(data);
```

- Those two function calls will get everything we need on a single page. The next step is to move to the next page. To do that, we increase the 'currentPage' variable by 1, and call the 'doCallForPagesLessThan10' function again, with the same original argument 'resultquery'.
- Your entire 'doCallForPagesLessThan10' function should look something like the following:

```
function doCallForPagesLessThan10(resultquery)
{
        if(currentPage<=pages)
        {
                var begin = currentPage*100;
                var url = createURL(begin, resultquery);
                $.get(url, function(data) {
                        if(data==null)
                        {
                                alert("There is no data");
                                document.getElementById("loading").
                                style.display="none";
                                return;
                        }
                         citePages[counter++] = getCitationCount(data);
                         getYearInformation(data);
                         currentPage = currentPage + 1;
                         doCallForPagesLessThan10(resultquery);
                })
                .error(function() { alert("There was an error"); return; });
        }
        else
```

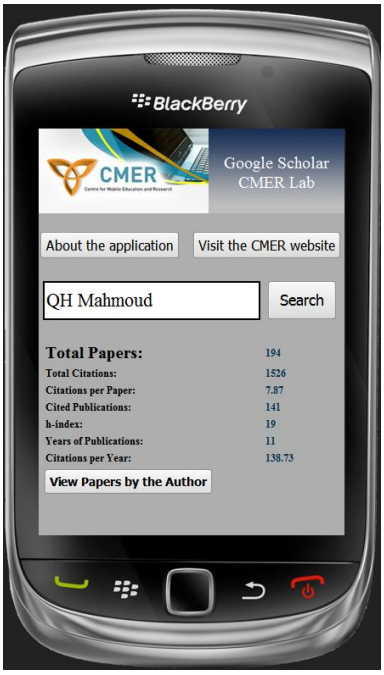
```
        {
                done = true;
        }
}
```

- You should be able to see how the ‘doCallForPagesLessThan10’ function works now. It will parse the data on the current page, increase a variable to move to the next page, and call itself to parse the next page. This process will continue until ‘currentPage’ is greater than ‘pages’. Once that happens, ‘done’ will be set to true, and the ‘wait’ function will then call ‘totalCites’ to display the results to the user.
- The process is the same for the ‘doCallForPagesEqualTo10’ function. The only difference is that the first IF statement will check if the ‘currentPage’ variable is less than or equal to 9. If it is, it will parse the page, save the results, move to the next page until all pages are completed. If not, the variable ‘done’ will be set to true, and the results will be displayed to the user. The ‘doCallForPagesEqualTo10’ function should look like the following:

```
function doCallForPagesEqualTo10(resultquery)
{
        //Starts at 0, goes to 9, therefore 10 pages
        if(currentPage<=9)
        {
                begin = currentPage*100;
                var url = createURL(begin, resultquery);
                $.get(url, function(data) {
                        if(data==null)
                        {
                                alert("There is no data");
                                document.getElementById("loading").
                                style.display="none";
                                return;
                        }
                        citePages[counter++] = getCitationCount(data);
                        getYearInformation(data);
                        currentPage = currentPage + 1;
                        doCallForPagesLessThan10(resultquery);
                })
                .error(function() { alert("There was an error"); return; });
        }
        else
        {
                done = true;
        }

}
```

- Now it is time to perform the final test of the application. Compile the program, and load it in the Ripple emulator and BlackBerry simulator. This time, search with the query ‘QH Mahmoud’ which has more than one page of results. Your application should display something similar to the following:



- Again, try pressing the 'View Papers by the Author' button, and make sure that the browser opens and brings you to the Google Scholar results. If everything works, that's great news. If not, re-trace your steps throughout the lab and make sure there aren't any mistakes in your code.
- The lab is now completed. You now have a fully functioning BlackBerry WebWorks Smartphone application which is able to communicate with an outside source on the web, parse results, and display them to the user. You can now use the skills gained in this lab to create other programs which communicate with other sources to complete similar or more complex tasks.