

# **Navigation Bar-3D Dynamic Map**

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## **Content:**

1. Abstarct.....	2
2. Motivation.....	3
2.1    Why Dynamic?.....	3
2.2    How Dynamic?.....	4
3. Navigation-Bar Construction.....	6
3.1    Use Guide.....	6
3.2    Frame and code.....	8
4. 3D Dynamic Map.....	9
4.1    Brief Rules.....	9
4.2    Expand Mode.....	10
4.3    Explore Mode.....	11
4.4    Frame and code.....	12
5. Back-end and Database.....	13
6. Future work.....	14

# 1. Abstact

Acemap is an integrated academic search system with vivid data visualization, which is presented on website as four maps: Academic map, Affiliation map, Topic map and Co-author map. Here inspired by the function of Topic map and the visualization of 3D-Heat map, we come up with a new idea by constructing a new map that after one or two levels of matching, it originates from just one point and it expands as the users click on whatever they like. Theoretically, the whole map has two parts: The Navigation-Bar and the main Dynamic Map. The function of navigation is to make the search more targeted and play the role of ambiguous matching. Then it links to the dynamic map, which has two modes and three layers: expand mode and explore mode for the detailed information, Author-Paper-Conference-Layers to visualize the data.

# 2.Motivation

## 2.1 Why dynamic?

The core is user-friendly. Sometimes visualization is a double-edged sword. The scene is considerably magnificent and of great meaning, however when it comes to searching for details, the visualization is somewhat disabled. Let us see Figure.1 and we will find it quite difficult to filter the useful information out.

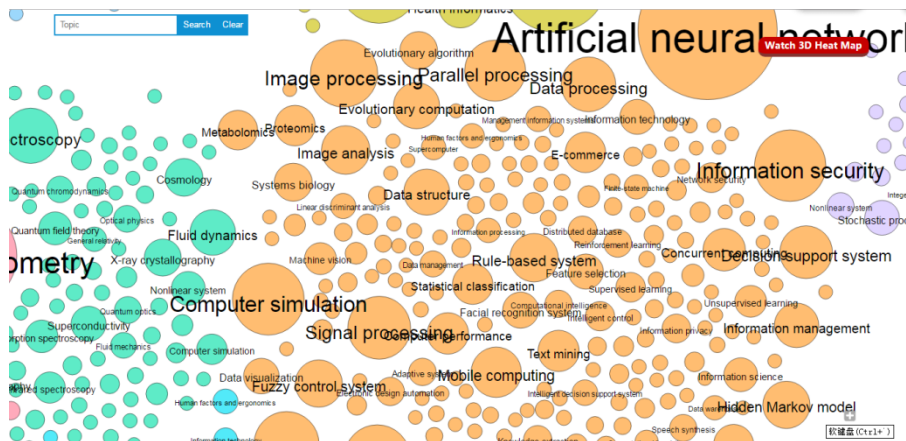


Figure.1

Secondly there comes the redundancy. For daily searching, we do not need so many irrelevant messages shown up. Direct way is somewhat more popular and accepted. Our design of new map gets rid of the waste information and uses navigation bar to catch the users' eyes and make them easily accessible to desired details. Meanwhile the dynamic part is also from one point, which turns out to be elaborate.

Last but not least the relationship between data is of great significance to users. Our design focuses on this and starts from three layers: author, paper and conference.

## 2.2 How Dynamic?

Generally speaking, we perform our design into three stages.

First stage is navigation. We have two levels of matching here. For the first level, we present 10 hottest topic that extracted from topic map as shown in Figure.2



Figure.2

Then the users find the desired topic and click it into the second level. Here we give the example of Computer Science in Figure.3

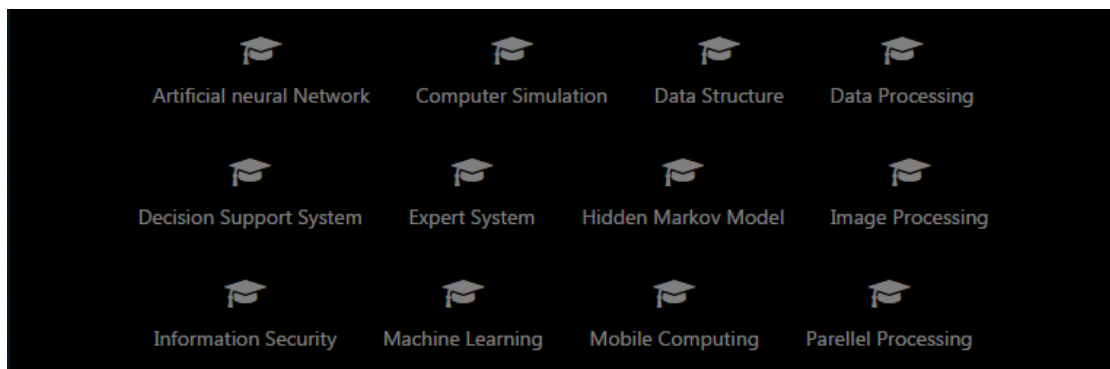


Figure.3

These two matching give an ambiguous searching for the wanted information. After click the button again, we get into the map. If we cannot get the desired button we can also use the search box below.

In the design of map, we initially present it as 3 points as in Figure.4 . Then we can expand it or explore it as in Figure.5. The style is just like a spreading random net.

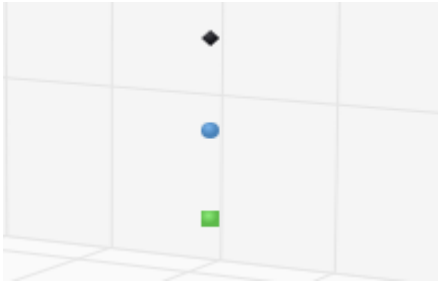


Figure.4

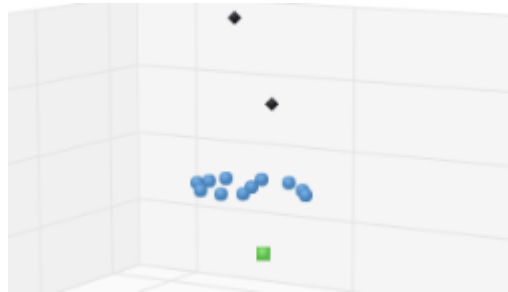


Figure.5

# 3.Navigation Bar Construction

## 3.1 Use Guide

In index.html we can find the main page of navigation shown as Figure.6. The Background images are in the style of the sliding image which is extracted from four main maps' background from the current acemap system, which interprets that our dynamic map is a cluster. It shows the whole image of the topic map and when we hover on the specific classification, the image below will turn to the 3D-heat map according to the topic the users choose.

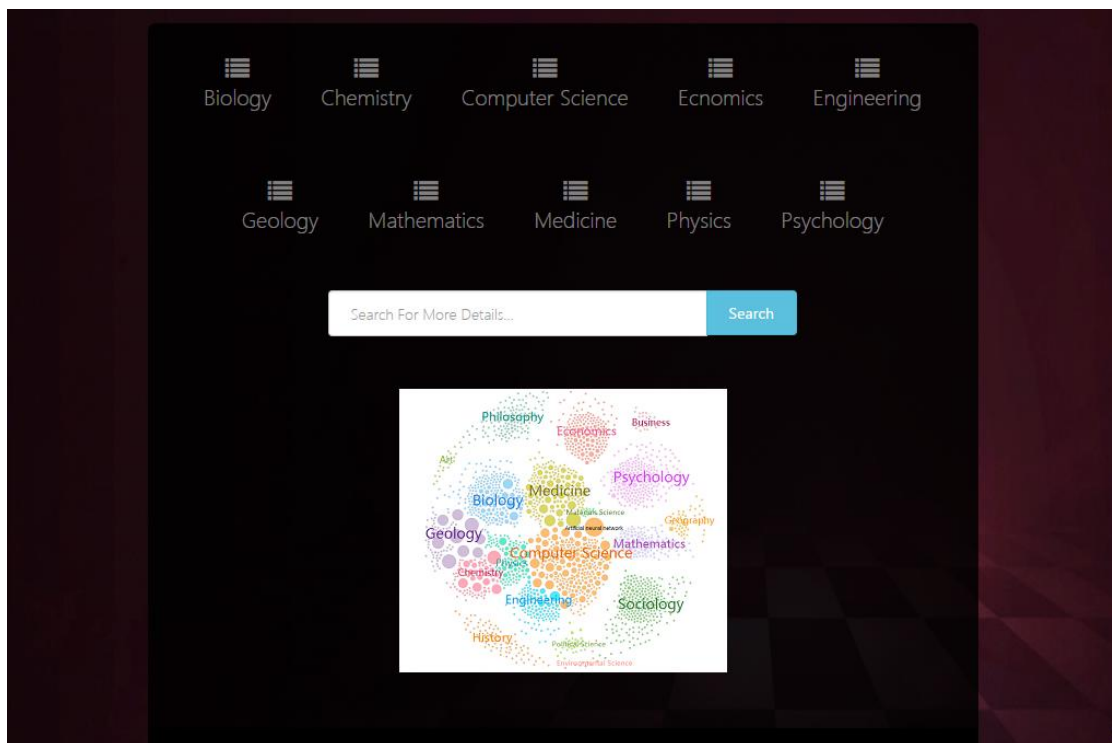


Figure.6

This is the first level matching. If the user cannot find their desired topic on the buttons, they can also use the navigation box as another option. When we get into the second level matching,

which is shown in Figure.7 (take mathematics as an example) and We will find the more specific classification of the main topic for users to choose. Once a button is chosen, the users will finally get into the main page of 3D dynamic map.

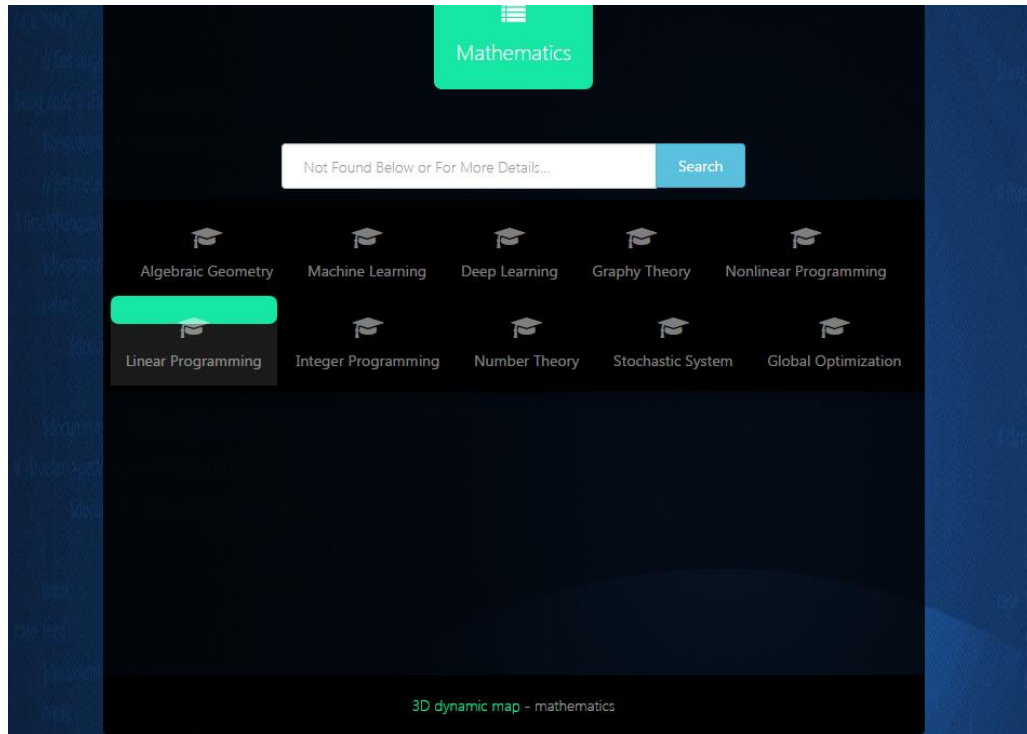


Figure.7

## 3.2 Frame and code

Here we use the same frame as the main page of acemap: Bootstrap. It has a lot of JS and CSS styles for us to use in an elaborate way. Below Figure.8 is the main part of the index.html

Others html files remain the same style. Totally there are 10 html files for each topic and one index.html for hyper-linking.

```
<ul class="fh5co-tab-menu" >
  <li><a href="#" onmouseover="showpic1()" onclick="javascript:window.location.href='Biology.html'" data-tab="1" >
    <span class="icon icon-list"></span><span class="menu-text">Biology</span> </a></li>
  <li><a href="#" onmouseover="showpic2()" onclick="javascript:window.location.href='Chemistry.html'" data-tab="2" >
    <span class="icon icon-list"></span><span class="menu-text">Chemistry</span></a></li>
  <li><a href="#" onmouseover="showpic3()" onclick="javascript:window.location.href='computerscience.html'" data-tab="3">
    <span class="icon icon-list"></span><span class="menu-text">Computer Science</span></a></li>
  <li><a href="#" onmouseover="showpic4()" onclick="javascript:window.location.href='Economics.html'" data-tab="4" >
    <span class="icon icon-list"></span><span class="menu-text">Economics</span></a></li>
  <li><a href="#" onmouseover="showpic5()" onclick="javascript:window.location.href='Engineering.html'" data-tab="5" >
    <span class="icon icon-list"></span><span class="menu-text">Engineering</span></a></li>
  <li><a href="#" onmouseover="showpic6()" onclick="javascript:window.location.href='Geology.html'" data-tab="6" >
    <span class="icon icon-list"></span><span class="menu-text">Geology</span></a></li>
  <li><a href="#" onmouseover="showpic7()" onclick="javascript:window.location.href='Mathematics.html'" data-tab="7" >
    <span class="icon icon-list"></span><span class="menu-text">Mathematics</span></a></li>
  <li><a href="#" onmouseover="showpic8()" onclick="javascript:window.location.href='Medicine.html'" data-tab="8" >
    <span class="icon icon-list"></span><span class="menu-text">Medicine</span></a></li>
  <li><a href="#" onmouseover="showpic9()" onclick="javascript:window.location.href='Physics.html'" data-tab="9" >
    <span class="icon icon-list"></span><span class="menu-text">Physics</span></a></li>
  <li><a href="#" onmouseover="showpic10()" onclick="javascript:window.location.href='Psychology.html'" data-tab="10" >
    <span class="icon icon-list"></span><span class="menu-text">Psychology</span></a></li>
</ul>
```

Figure.8

Here is the sliding background image part Figure.9 (we use the same java-script as the initial index of acemap)

```
<ul id="banner_img" >
  <li class="item1">
    <div class="wrapper">
      <div class="ad_img" ></div>
    </div>
  </li>
  <li class="item2">
    <div class="wrapper">
      <div class="ad_img" ></div>
    </div>
  </li>
  <li class="item3">
    <div class="wrapper">
      <div class="ad_img" ></div>
    </div>
  </li>
  <li class="item3">
    <div class="wrapper">
      <div class="ad_img" ></div>
    </div>
  </li>
</ul>
```

Figure.9



# 4. 3D Dynamic Map

## 4.1 Brief Rules

When we link to the main map from the navigation bar, we will notice that there are three points shown in the center of the container. Under the container lies four boxes and a button called 'reset'. The first three boxes represent the three layers that shown in the container and the users decide which to reveal or conceal. Obviously the button is to reset the choice to original style. The initial dynamic page is shown in Figure.10 in the following.

Here in order to have a good experience of viewing, we put the x,y,z axis and the whole block visible.

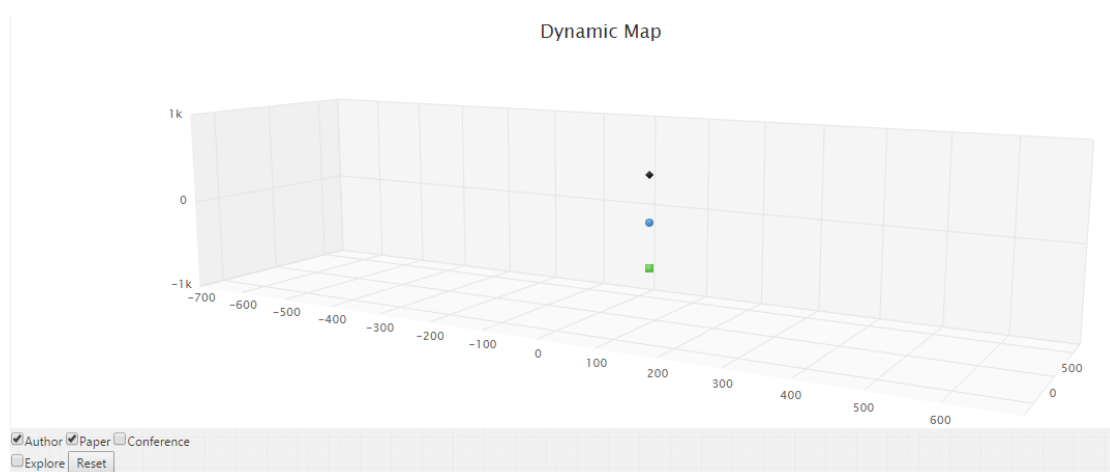


Figure.10

## 4.2 Expand mode

As mentioned above, the first three boxes is to choose which layers to be visible, the last box represents the mode we choose. Typically, we have two modes. Here comes the first mode: Expand.

Expand mode is to transform the original three points to large numbers of points. By just a click and the user will experience the net-like 3D spreading movement of the whole point. The more relevant the points are, the more closer the points will be shown . It can be called as a ambiguous cluster of points. Meanwhile The distribution of these points is randomly calculated.

Our expanding role is to select approximately the most relevant 10 papers that have the most impact on the original one (like influenced by authors, citations and so on) The data is extracted from the database by our group.

Here we give you an example of three-click expand mode in Figure.11. The related paper is listed under the container.

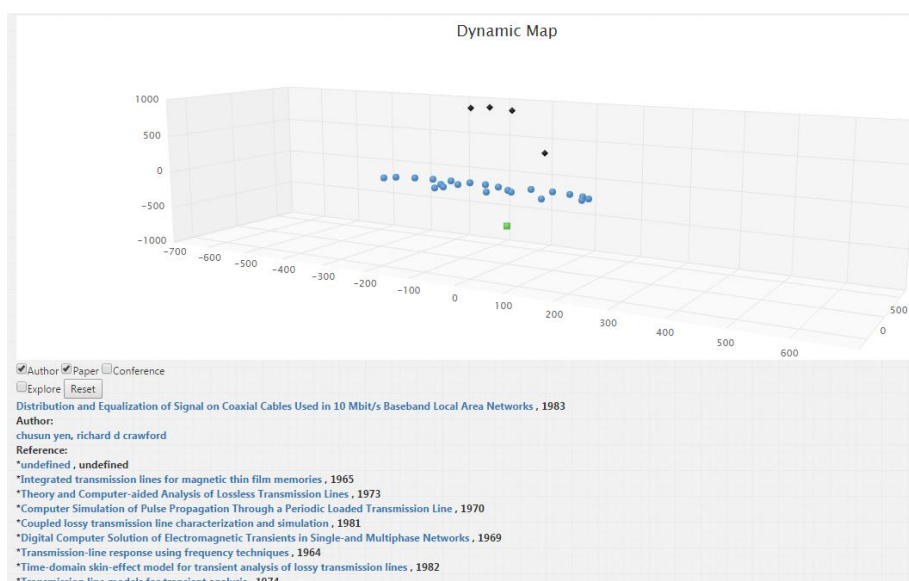


Figure.11

### 4.3 Explore Model

If the user choose the 'explore' button then the whole map will stop expanding and try to find the relationship between each other. If we click the point in the paper layer, the back-end will draw a line connected to the father paper (the father point). Also when we click the author layer's point, it will connect with the author's paper in paper layer and automatically draw many lines to connect all the points that is relevant to this paper in paper layer.

If you feel a little abstract, here comes the Figure.12 to give you a better understanding of the process.

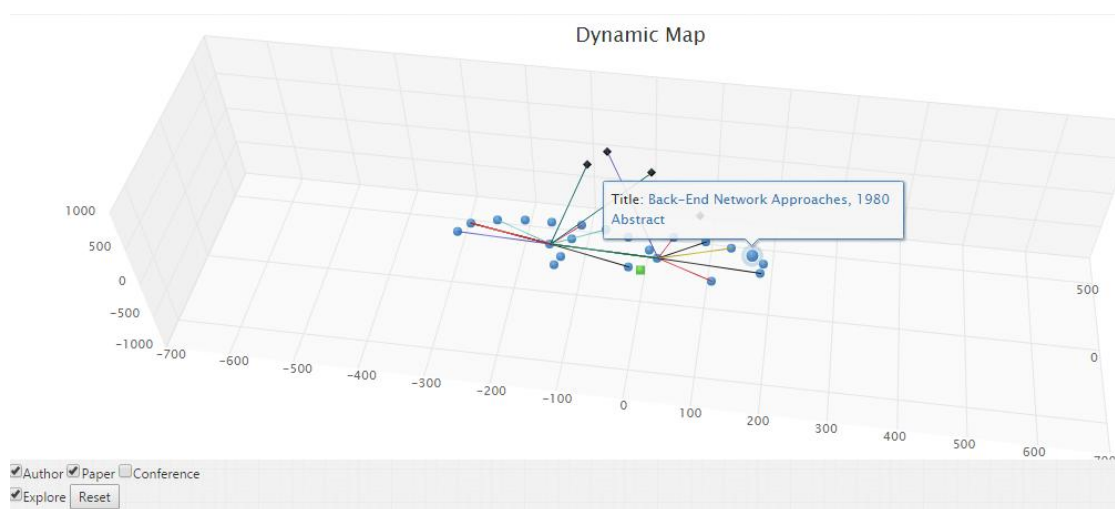


Figure.12

## 4.4 Frame and code

We use D3.js to accomplish the data visualization and use the Highchart.js to accomplish the 3D model (in Figure.13) When it comes to the process of adding lines , see Figure.14.

```
// Give the points a 3D feel by adding a radial gradient
Highcharts.getOptions().colors = $.map(Highcharts.getOptions().colors, function (color) {
  return {
    radialGradient: {
      cx: 0.4,
      cy: 0.3,
      r: 0.5
    },
    stops: [
      [0, color],
      [1, Highcharts.Color(color).brighten(-0.2).get('rgb')]
    ]
  };
});
var renderer = new Highcharts.Renderer(
  $('#container')[0],
  400,
  400
);
```

Figure.13

```
function addLine(p,q) {

  if (!hashMap.contains(p) || !hashMap.contains(q)) return;
  var id1=hashMap.get(p),type1;
  if (p[0]=='P') type1=0;
  else if (p[0]=='A') type1=1;
  else if (p[0]=='C') type1=2;
  var x=chart.series[type1].data[id1].x+0.00001,
      y=chart.series[type1].data[id1].y+0.00001,
      z=chart.series[type1].data[id1].z+0.00001;

  var id2=hashMap.get(q),type2;
  if (q[0]=='P') type2=0;
  else if (q[0]=='A') type2=1;
  else if (q[0]=='C') type2=2;
  var tx=chart.series[type2].data[id2].x+0.00001,
      ty=chart.series[type2].data[id2].y+0.00001,
      tz=chart.series[type2].data[id2].z+0.00001;

  chart.series[type1].data[id1].color=chart.series[type1].color;
  chart.series[type2].data[id2].color=chart.series[type2].color;

  chart.addSeries({
    type:'scatter',
    data: [[x,y,z],[tx,ty,tz]],
    marker: {
      enabled: false
    },
    lineWidth:1
  });
};
```

Figure.14

# 5 Back-end and database

This part is to extract datasets from our database using sql. Although our current design doesn't use the data that extracted from the database and as an instead directly consults the data on database, we find it necessary to use it for faster speed and well fluency. Below three pictures show our work of extracting and we put the message on the console of the website.(Figure.15,16,17)

```

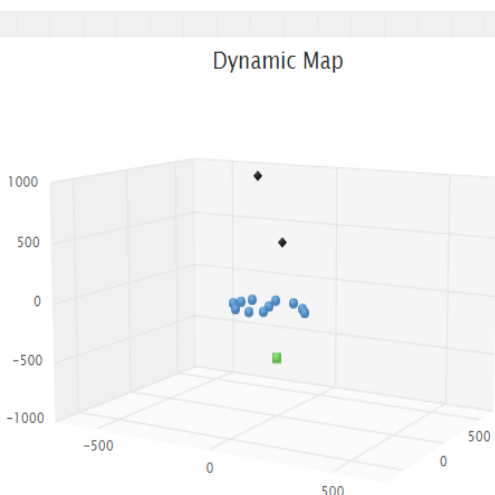
$papernumtmp = $papernum;
$sql2 = "SELECT distinct PaperID FROM PaperKeywords WHERE FieldOfStudyIDMappedToKeyword like '$FieldID'";
$result2 = $conn->query($sql2);
if ($result2->num_rows > 0){
    while($row = $result2->fetch_assoc()){
        $papers[$papernum][$zero] = $row["PaperID"];
        $papers[$papernum][$zero+] = 0;
        if($papernum == 0) $paperarray = array(array('Fieldid'=>$FieldID,'id'=>$row["PaperID'],'citation'=>0));
        else array_push($paperarray,array('Fieldid'=>$FieldID,'id'=>$row["PaperID'],'citation'=>0));
        $papernum ++;
    }
    for($i = $papernumtmp ; $i < $papernum; $i++){
        $stppaper = $papers[$i][$zero];
        $sql3 = "SELECT distinct CitationCount FROM PaperCitationCount WHERE PaperID like '$stppaper' ";
        $result3 = $conn->query($sql3);
        if ($result3->num_rows > 0) {
            // output data of each row
            while($row = $result3->fetch_assoc()) {
                echo "CitationCount: " . $row["CitationCount"]. "\n";
                $papers[$i][1] = $row["CitationCount"];
                $paperarray[$i]['citation'] = $row["CitationCount"];
            }
        }
    }
} else{
    echo "0 results";
}

```

1	011D6B59	80D77B2D	511
2	011D6B59	78D4756C	488
3	011D6B59	80FE031F	425
4	011D6B59	79D2E8E7	186
5	011D6B59	76C203AA	154
6	011D6B59	594B9112	124
7	011D6B59	768C3BD2	99
8	011D6B59	77903C76	80
9	011D6B59	75D34964	69
10	011D6B59	7B121EAC	66
11	2232984	81028FCE	70
12	2232984	758A74E2	31
13	2232984	7936A5A0	27
14	2232984	7B124246	21
15	2232984	603BD9D4	10
16	2232984	68B5D2E4	8
17	2232984	7B222984	8
18	2232984	03B568CD	6
19	2232984	5BF113DF	5
20	2232984	7659C1C0	4
21	2246634	7FF0624C	166
22	2246634	76BF44FF	35
23	2246634	7DCBD039	34
24	2246634	6E9F8964	33
25	2246634	7682C9E8	32
26	2246634	800AC541	25
27	2246634	79542012	24
28	2246634	7D35DE8E	18
29	2246634	8105FE48	16

Figure.15

Figure.16



```

hashMap ▶ Object
move
click!
▶ H.Point {series: object, color: Object, proceed: null, x: 49.42913948391548, y: 0...}
▶ H.Point {series: object, color: Object, proceed: null, x: 49.42913948391548, y: 0...}
success
▶ Object {fatherIndex: "0", refPaper: Array(10), refAuthor: Array(1), refConfer: Array(0), fatherType: 0}
Papername P7EE0862 Fibernet: Multimode Optical Fibers for Local Computer Networks 1978
Papername P7CD2C0B1 The control data loosely coupled network lower level protocols 1980
Papername P6EEDCF8A Evolution of the Ethernet Local Computer Network 1982
Papername P7799ACE9 A theoretical performance analysis of polling and carrier sense collision detection communication systems 1981
Papername P7728B5B5 An overview of the proposed american national standard for local distributed data interfaces 1983
Papername P8167CD79 Distribution and Equalization of Signal on Coaxial Cables Used in 10 Mbit/s Baseband Local Area Networks 1983
Papername P7AF8EFE4 Back-End Network Approaches 1980
Papername P7EA89D03 SILK: An Implementation of a Buffer Insertion Ring 1983
Papername P7DA97425 An experimental distributed switching system to handle bursty computer traffic 1969
Papername P7F3CD4C6 Local-Area Subnetworks: A Performance Comparison 1981
author A7D36F287 william stallings

```

Figure.17

## **6.Future work**

We haven't complete our work yet. The conference part is empty now and the dataset is not fully prepared, which remains to be done. Also the connection between navigation bar and 3D dynamic map need more discussion.

In conclusion, this term we establish the dynamic map to 75%, and we feel pleased about what we have done. We will try our best to accomplish this work.

Dynamic map team

2015.5.17