AJAX 2 IN 1: INTERACTIVE EDUCATION AND MODERN WEB TECHNOLOGY

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Abstract: In our days, in the age of WEB 2.0 it is very important that our web applications should be real applications instead of websites. In this article we talk about the AJAX, which has revolutionised the making of web applications, with it, we can build better, faster and user friendly Internet contents.
In our research, we call the AJAX to serve education. With this technology we create an adaptive practise test, which not only evaluates the answers in real time, but it has an abbility to change the following questions, depending on the correct or incorrect answers of the student.
The article touches the area of the artifical intelligence and data mining, and we get a taste of real time semantic answer analysis, everyone makes sure that the AJAX satisfies the expectations of the most obesseed WEB 2.0 fans. You can also discover its possibilities and understand, why iWiW and Google like this technology.

Keywords: ajax, education, interactive, computer programming, web

1. Introduction

The AJAX word is familiar for most people. Mentioning the word men are immediately interested in the result of Ajax - Arsenal final, while women are asking the name of the supermarket where the 750 ml version has the cheapest price.
But in this article, we discuss the AJAX which has revolutionised the making of web applications, with the help of which we can build better, faster and user friendly Internet contents.

2. What is AJAX?

AJAX is not a new technology. It is really several technologies, each flourishing in its own right, coming together in powerful new ways. Ajax incorporates

- XHTML and CSS for standard-based presentation
- dynamic display and interaction using the DOM (Document Object Model)
- data interchange and manipulation using XML
- XMLHttpRequest object for the asynchronous data communication - this is the heart of the AJAX.
- and JavaScript for client-side data processing, and binding everything together

Altogether they build up a powerful team, so the name is Asynchronous JavaScript And XML

3. Communication

The essence of the technology is that AJAX – using the XMLHttpRequest JavaScript object - changes data with the webserver, while the webpage does not reload. Ajax changes data asynchronously between the browser and the webserver (with HTTP requests), so instead of downloading the whole website, we reload only certain parts of the site.[1]
How does it work? The communication of a classic web application looks like this:
1. The user clicks on the website, fills a form then presses a button or clicks on a link.
2. The browser sends information to the webserver via http requests.
3. The webserver does some processing, (retrieving data, calculating, talking to various authentication systems, etc.) then returns a new HTML page to the client. [1]

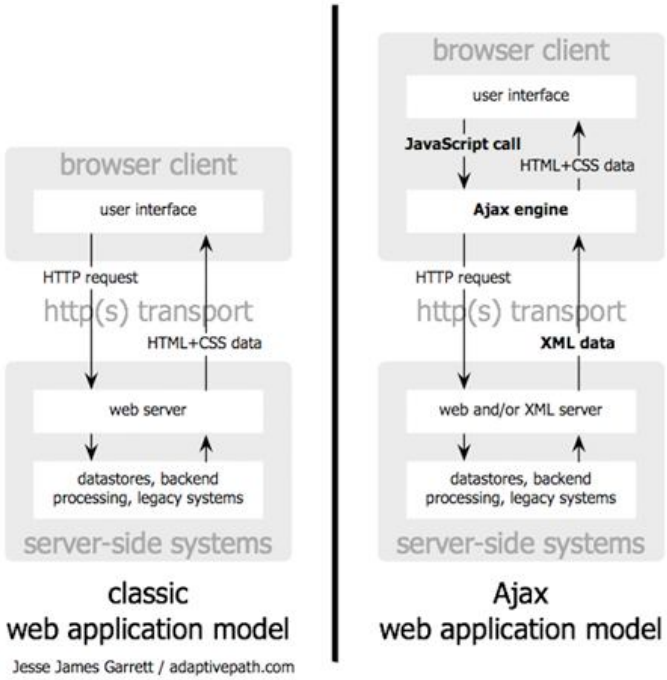

Figure 1.
The difference between the communication of classic and AJAX web application

4. Syncronous VS Asyncronous

What is the problem with it?

- The page stops until the request to the webserver has finished. The user waits and waits for the answer, for the new page or the result.
- The whole page is downloaded (images, style sheets, HTML elements), even if only a part of the page has been changed.
- Because of this, unnecessary data transfer is generated, the main result of which is that the user waits more and more.

So in this way we can easily find out that paying thousands for marketing advice was for nothing – where the main stream was to call our website web application without any confidence - because there is no user who beleieves us when he stays hours in front of the monitor waiting for the browser to load the actual webpage. [1]

So that is the point where AJAX and the asyncronous communication get on the stage

The word asyncronous means that the presentation of the current page and the background communication with the webserver are separate from each other. While AJAX waits in the background to recieve data from the server, the user can use the current page without any problem and waiting.

- When the data arrive, the AJAX engine puts it to the page modifing only the changed part of the page instead of changing the whole page.
- Because only the changed data move between the browser and the webserver, the communication and the data display is faster.
- Doing it without the usual webpage reload „flickering", so the user does not realize that the current page already contains new information.

With this tool we can market our new web application genuinely, because all the speed and feeling are similar to a desktop application, which also has all the good features of the web.

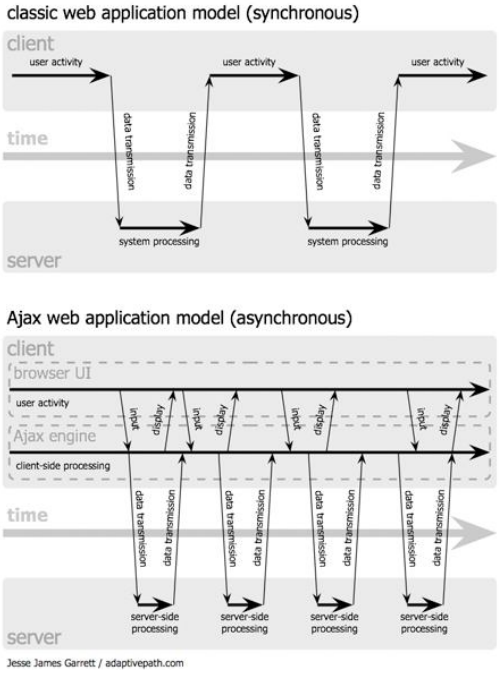

Figure 2.
Syncronous and Asyncronous communication

5. Step by step
Well, let us see, step by step, how can we cloth our webpage with AJAX, how we can make very useful educational applications using AJAX and some Artifical Intelligence.

First step: Create an XMLHttpRequest istance.

```
22          request = new XMLHttpRequest();
```

Figure 3.
Create an XMLHttpRequest instance

Ok, we did it, but life is not so easy. As we know, the Internet Explorer has different object names from Mozilla products, so we must take care of it.[2]

```
17      try {
18      request = new ActiveXObject("Microsoft.XMLHTTP");    // Próbáljuk ki az  Internet Explorer -t
19       }
20       catch(e)    // Nem sikerült
21       {
22           request = new XMLHttpRequest();    // Többi böngésző
23       }
```

Figure 4.
Taking care of browser compatibility

Second step: Waiting for the answer
The *onreadystatechange* attribute serves this, it runs when the data have arrived

```
54      http_request.onreadystatechange=function()
55      {  // itt rendelkezünk arról, hogy mi legyen a válaszul megkapott adatok sorsa
```

Figure 5.
Waiting for the answer

Third step: Create the request.
We use for this the methods and attributes of the ugly named XMLHttpRequest object

Attributes
readyState - holds the state of the request process, it should have 4 values
0 – the request has not started
1 – connection estabilished
2 – request sent
3 – answer in process
4 – ready
status: the state of the requested page 200 OK, 404 if the page is not found – we do not use it now
responseText: holds the recieved string from the server
For us, the most important state if the new data have arrived, the request process is finished, so we need the following code

```
56          if(http_request.readyState == 4)
57          {
58          document.getElementById("tartalom").innerHTML = http_request.responseText;
59          }
```

Figure 6.
Displaying the result of the request process

Methods
open(mode, url, boolean)
This method opens a channel to the server with the following parameters.
These are similar to a simple HTML FORM
mode – the mode of the data transfer GET or POST
url – the name or the url of the file which processes our request

boolean – true / false – this switch indicates the mode of the connection asyncronous / syncronous, of coures we will connect asyncrounosly because all the article is about asyncrounos connection
at the end we need the send (string) method where we can send the parameters to the program given in the url. We use it only in POST mode, in GET mode we must give null value to the string. [5,6]

```
61          http_request.open("POST", url, true);
62          http_request.setRequestHeader("Content-Type", "application/x-www-form-urlencoded; charset=utf-8");
63          http_request.send(content);
```

Figure 7.
Methods we use

Well, let us see the AJAX engine.

```
function Write(url, content)    //az url a feldolgozó script, a content pedig a paraméterek
{
    var http_request = CreateHttpRequest();

    http_request.onreadystatechange=function()
    {  // itt rendelkezünk arról, hogy mi legyen a válaszul megkapott adatok sorsa
        if(http_request.readyState == 4)
        {
        document.getElementById("tartalom").innerHTML = http_request.responseText;
        }
    };
    http_request.open("POST", url, true);
    http_request.setRequestHeader("Content-Type", "application/x-www-form-urlencoded; charset=utf-8");
    http_request.send(content);
}


function submitForm(kid,vid,seid,valasz,cheat)
{
    var content = "kerdesid="+kid+"&valaszid="+vid+"&seid="+seid+"&valasz="+valasz+"&cheat="+cheat;
    Write("lista.php", content); //a lista.php dolgozza fel a kérés a content paraméterek alapján

}
```

Figure 8.
AjAX engine

6. AJAX and the Real World

AJAX applications really work even in real enviroment, everyone has met it, everyone knows Google search, the AJAX content of it is Google Suggest. [7]
Google Suggest does not do more than, after typing a character, running a request in the background and giving back the results of the current partstring. Doing it, of course, with AJAX.
But the most important thing is that we can easily create AJAX applications.

Own AJAX: The intelligence test

In our research, we call the AJAX to serve the education. With this technology we make an adaptive practise test (www.nagyzsolt.hu/ajax) [3], which not only evaluates the answers in real time, but has an abbility to change the following questions, depending on the correct or incorrect answers of the student.
Our system can handle different type of questions, in our example we ask test and essay style questions, we also seperate the essay questions into two groups depending on whether we want an exact answer or we accept an alternative one.

Real time evaluation

Thanks to the AJAX, at the very moment the studnet answers the question, s/he gets feedback on whether the solution is correct or not. Because of the real time processing, we can magnificently use the adaptation, it means that we can change the number or the type of the questions on the fly depending on the answers. Besides other things that is why the system is handy and easy-to-use, so the student is more motivated and the process is more effective.

Adaptive

So we have reached the key question. In many type of surveying it is very important to ask targeted question, no matter if it is a practice exercise, a survey, competence analysis or a psychology or socialpsychology question.
Basic demand, expectation in every subject is that if we already have sufficient quality and quantity answers, we should not disturb the student any more, rather turn to the next subject (we will show it in our exercise).
On the other hand, if the question groups depend on each other, we should ask only those questions which we wish an answer for. For example, if we ask a student if he has an Internet connection at home or not, and he answers he does not, the next question should not be 'And which type of Internet connection do you have?', so the system steps over this type of questions in an intelligent and automated way. Now we know the AJAX, so we can solve this problem unnoticedly.

Intelligence Essay Evaluation

While in case of the test style questions we can check the solution with a simple equal sign, we need a hard job with the essay questions.
We should analyse the answers, evaluate them and, if the results match the given rules, only in that case can we decide whether the answer is correct or not.
In this way, this part of the program touches the subject of data mining and text analysis, and we can easily say the artifical intelligence also appears in the process of solution.
We convert the answer and the knowledge base of the solution in the same codepage and lowercase, so we can compare them more flexibly.
We split the answer into words, this solves the problem of punctuation.
We compare the words of the answer and the set of the solution based on the knowledgebase. This way we can determine the rate of the correct answers.
Based on the rules we decide if we accept the solution as good or not.

CheatBuster, the super weapon

Well, at the end of the article, here is some dessert. The good sounding, a bit brassy name is probably the nightmare of the students, at the same time the favourite weapon of the teachers against whispering and cheating.
This is the end of the questions like 'Hey man, which is the correct answer for the question number 6?"'– 'B'.
Beacause when activating the super weapon, all the students get the possible answers in differet order. That is, if they fill the test at the same time, the correct answers will be behind different letters for everyone.
You can say, there are survey programs which also have this feature. You are right.
But it is not only about generating different testpages, but during filling the test, the order of the solved and unsolved answers are also changing on the fly. Thanks to the AJAX, the student does not even recognize anything. [4]

Conclusions

The technology discussed in this article can be an interesting educational methodology. Is it true that, with this system, exercise solution and making a survey is more efficience?
At the „Multimédia az oktatásban 2009" conference it was mentioned that this publication can be a basis of many interesting research in the future, so please do not hesitate to use the posings mentioned above, use the revolutionary technology in interactive education and education methodology research as well.

References

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