Customizing Web Advertisements
Based on Internet Users' Location

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Abstract: The current trend in terms of internet marketing is to provide comprehensive business, targeting internet users regardless of their location. However, there are many advertisements for local organizations that are posted on sites of national or planetary interest. In this case, the question arises: How can I view, as an Internet user, only the advertisements of organizations from my geographic area? This paper presents a model to customize advertising websites and offers a solution to use JavaScript geolocation by means of IP.

Key-Words: - geolocation, IP, web personalization, cybermarketing

1. IP-based Geolocation

Geolocation technology resides in finding a real world location of an object (such as a mobile phone) or a computer connected to the Internet. Geolocation Positioning is very similar.

IP-based geolocation is a technique for determining the place where web access takes place, depending on the IP of neighbouring servers and routers.

IP (Internet Protocol) is a protocol that provides a data transmission service without permanent connection. It identifies each logical interface device connected by a number called an IP address. Standard version used in most cases is IPv4. In IPv4, the current standard for Internet communication, the IP address is represented by 32 bits (e.g. 192.168.0.1). Allocation of IP addresses is not arbitrary, as it is the organization which is responsible for distributing address space. For example, it is responsible for managing the RIPE address space assigned to Europe. RIPE, Réseaux IP Européens, is a forum that addresses entities interested in developing the Internet. The main objective of the RIPE community is to ensure continuity of technical coordination and its management. [9]

The Internet is in the process of moving towards the next version of IP, called IPv6, which basically expects a major user, requiring the use of this superior version by others, too. Branches of the U.S. Ministry of Defence of USA (DOD) announced that during the years 2009 to 2011, they will cease relations with ISPs that do not use IPv6.

Geolocation can be made using the Internet Protocol address (IP), MAC address, RFID or GPS technologies.

Geolocation is usually based on IP address and service type as WHOIS, used to receive data physical address.

WHOIS is a protocol search / response, widely used to search in the official database to determine the holder of a domain, IP address or autonomous system numbers from the Internet. WHOIS searches were done traditionally through a command line interface, but now there are several websites that offer simple ways to search through databases. WHOIS running on port 43 TCP [8].

Geolocation based on IP address can provide information such as country, region, city, zip code, latitude, longitude and time zone.

In his article (http://www.linuxjournal.com/article/7856, Geolocation by IP Address, Oct 25, 2004), Andrew Turner argued: "Determining geographic locations based on Internet IP offers localization services and brings together user communities without the need for GPS receivers or complicated configuration switching. The Internet has become a collection of resources meant to appeal to a large general audience. Although this multitude of information has been a great boom, it has also diluted the importance of geographically localized information. Offering the ability for Internet users to garner information based on geographic location can decrease search times and increase visibility of local establishments. Similarly, user communities and chat-rooms can be enhanced through knowing the locations (and therefore, local times, weather conditions and news events) of their members as they roam the globe.

It is possible to provide user services in applications and Web sites without the need for users to carry GPS receivers or even to know where they themselves are."

2. The Advantages of Using Geolocation

By using geolocation by IP address, the customization of the site could be created according to user location.

Using the model we propose, the advertisements on the site can be customized, depending on the geographical area. We can distinguish two types of advertisements on the web:

1. advertisements with general interest products which can be sold in all areas of the Internet, for example a brand of cars, an air transport company or hotel chain;
2. advertisements of products / local organizations, whose views of internet users in other areas do not lead to an increase in sales, for example a beauty salon, a pizzeria and a cafe.

Another advantage is the possibility of hosting a much higher number of advertisements in the site, and thus bringing a higher profit for the owners of these sites.

3. IP-based services geolocation

CAIDA, the Cooperative Association for Internet Data Analysis was the first entity that tried to create and use IP-based geolocation. The project created by CAIDA was called NetGeo. This project created a freely accessible database that could locate an address in the network. The scheme involves complex rules, the database was slow but the information shown was correct. The project was closed and the license was sold to other partners. The database is still available, and despite the fact that it has not been updated, it provides accurate information.

Now, there are many other organizations that provide free or fee geolocation services. Sites like http://www.infosniper.net/ offers Internet users information about the location and the map, based on latitude and longitude coordinates, maps provided by google maps (Fig. 01).

Fig. 01 – The information provided by http://www.infosniper.net

4. The model of site personalization using IP-based geolocation

Suppose we have a site where we want to introduce the following advertisements:
- Advertisements for internet users from Brasov
- Advertisements for internet users from Bucharest
- Advertisements for internet users from Iasi
- Advertisements for internet users from Constanta
- General advertisements to internet users from other locations

In order to create the model, I used the design tool JSON API created by http://ipinfodb.com. This model is written in JavaScript and has been tested with Fire Fox 3.5, Opera 10, Chom IE 5 and 8.

Using JSON module lead to the following results:
- IP
- Country Code
- Country Name
- Region Code
- Region Name
- City
- Zip Postal Code
- Latitude
- Longitude
- Time zone

```
<?xml version="1.0" encoding="UTF-8" ?>
- <Response>
    <Ip>193.254.230.201</Ip>
    <Status>OK</Status>
    <CountryCode>RO</CountryCode>
    <CountryName>Romania</CountryName>
    <RegionCode>09</RegionCode>
    <RegionName>Brasov</RegionName>
    <City>Brasov</City>
    <ZipPostalCode />
    <Latitude>45.6333</Latitude>
    <Longitude>25.5833</Longitude>
    <Timezone>0</Timezone>
    <Gmtoffset>0</Gmtoffset>
    <Dstoffset>0</Dstoffset>
  </Response>
```

Fig. 02 - Results of the JSON API

JavaScript code can be inserted into any web page to customize the information containing images or text.

The algorithm is:
Step 1. It reads the user's IP address and search in the database ipinfodb.com to locate city.

Step 2. It selects the appropriate image depending on the city of internet users. If the city is not listed in all the cities for which the customization is done, a general picture will be inserted.

```
<html>
<head>
<script type="text/javascript">
//http://ipinfodb.com/ip_location_api_json.php
//IPInfoDB javascript JSON query example
//Tested with FF 3.5, Opera 10, Chome 5 and IE 8
//Geolocation data is stored as serialized JSON in a
cookie

function geolocate(timezone, cityPrecision, objectVar)
{

  var api = (cityPrecision) ? "ip_query.php" :
"ip_query_country.php";
  var domain = 'ipinfodb.com';
  var url = "http://" + domain + "/" + api +
"?output=json" + ((timezone) ? "&timezone=true" :
"&timezone=false" ) +"&callback=" + objectVar +
".setGeoCookie";
  var geodata;
  var callbackFunc;
  var JSON = JSON || {};

  // implement JSON.stringify serialization
  JSON.stringify = JSON.stringify || function (obj) {
    var t = typeof (obj);
    if (t != "object" || obj === null) {
      // simple data type
      if (t == "string") obj = '"'+obj+'"';
        return String(obj);
```

```javascript
    } else {
     // recurse array or object
     var n, v, json = [], arr = (obj && obj.constructor
== Array);
     for (n in obj) {
      v = obj[n]; t = typeof(v);
      if (t == "string") v = '"'+v+'"';
      else if (t == "object" && v !== null) v =
JSON.stringify(v);
      json.push((arr ? "" : '"' + n + '":') + String(v));
     }
     return (arr ? "[" : "{") + String(json) + (arr ? "]" :
"}");
    }
  };

  // implement JSON.parse de-serialization
  JSON.parse = JSON.parse || function (str) {
    if (str === "") str = '""';
    eval("var p=" + str + ";");
    return p;
  };

  //Check if cookie already exist. If not, query
IPInfoDB
  this.checkcookie = function(callback) {
    geolocationCookie = getCookie('geolocation');
    callbackFunc = callback;
    if (!geolocationCookie) {
     getGeolocation();
    } else {
     geodata = JSON.parse(geolocationCookie);
     callbackFunc();
    }
  }

  //API callback function that sets the cookie with the
serialized JSON answer
  this.setGeoCookie = function(answer) {
    if (answer['Status'] == 'OK') {
     JSONString = JSON.stringify(answer);
     setCookie('geolocation', JSONString, 365);
     geodata = answer;
     callbackFunc();
    }
  }

  //Return a geolocation field
  this.getField = function(field) {
    try {
     return geodata[field];
    } catch(err) {}
  }

  //Request to IPInfoDB
```

```javascript
  function getGeolocation() {
    try {
     script = document.createElement('script');
     script.src = url;
     document.body.appendChild(script);
    } catch(err) {}
  }

  //Set the cookie
  function setCookie(c_name, value, expire) {
    var exdate=new Date();
    exdate.setDate(exdate.getDate()+expire);
    document.cookie = c_name+ "=" +escape(value) +
((expire==null) ? "" :
";expires="+exdate.toGMTString());
  }

  //Get the cookie content
  function getCookie(c_name) {
    if (document.cookie.length > 0 ) {
     c_start=document.cookie.indexOf(c_name + "=");
     if (c_start != -1){
      c_start=c_start + c_name.length+1;
      c_end=document.cookie.indexOf(";",c_start);
      if (c_end == -1) {
       c_end=document.cookie.length;
      }
      return
unescape(document.cookie.substring(c_start,c_end));
     }
    }
    return '';
  }
}
</script>
</head>
<body>
<script type="text/javascript">

//function geolocate(timezone, cityPrecision,
objectVar).
//If you rename your object name, you must rename
'visitorGeolocation' in the function
var visitorGeolocation = new geolocate(false, true,
'visitorGeolocation');

//Check for cookie and run a callback function to
execute after geolocation is read either from cookie or
IPInfoDB API
var callback = function(){
        alert('Your city is : ' +
visitorGeolocation.getField('City'))
        };
visitorGeolocation.checkcookie(callback);
```

```
// write the name of the city in variable tmp
var tmp=visitorGeolocation.getField('City');

//insert an image according the name of the city, if the
city is not in our list, the function insert a general
picture - earth.jpg

if (tmp=='Brasov')
 {
 document.write('<img src="brasov.jpg" border=0>')
 }
 else
   {
   if (tmp=='Bucuresti')
     {
     document.write('<img src="bucuresti.jpg"
border=0>')
     }
     else
       {
       if (tmp=='Constanta')
         {
         document.write('<img src="constanta.jpg"
border=0>')
         }
         else
           {
           if (tmp=='Iasi')
             {
             document.write('<img src="iasi.jpg"
border=0>')
             }
             else
               {
               document.write('<img src="earth.jpg"
border=0>')
               }
             }
           }
         }
</script>
</script>
</body>
</html>
```
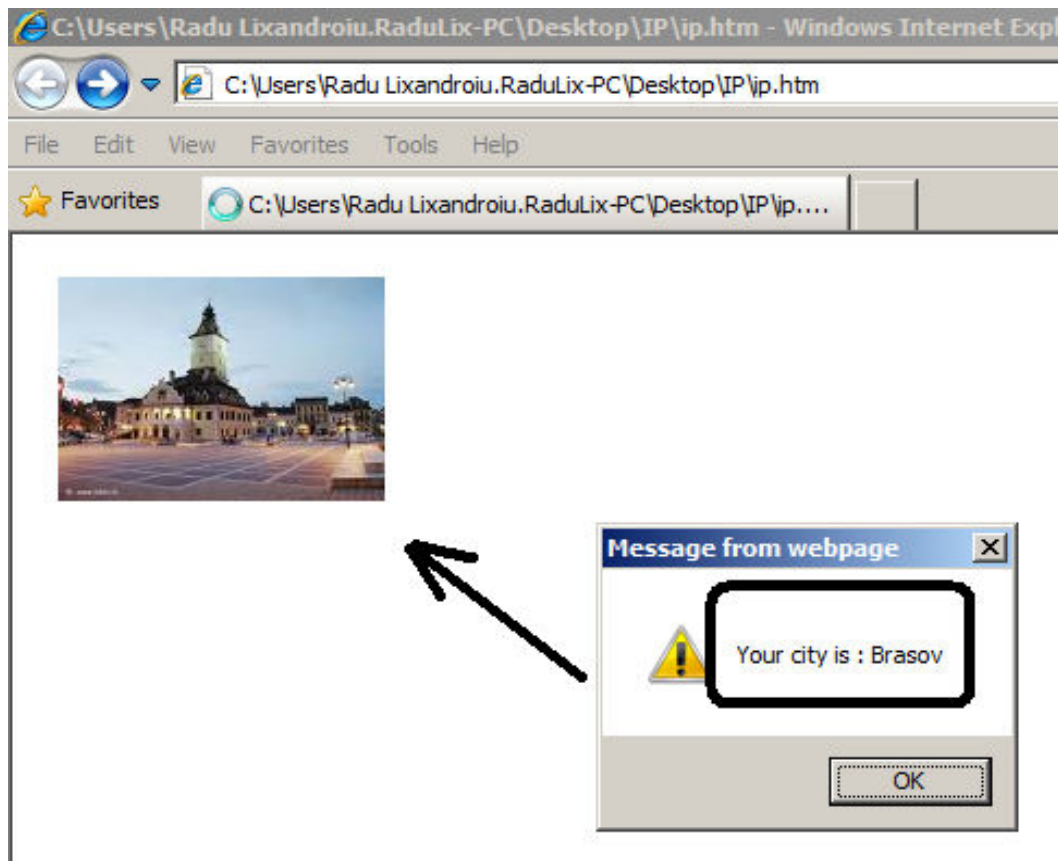

Fig. 03 – The results of application – i.e. the IP (193.254.230.201), city - Brasov

Conclusions

Web personalization has become a ubiquitous technology. Customizing turns web pages into a personal way of communication. Providing individualized content, personalized web pages facilitate web-surfing and browsing activities as business-to-consumer. By personalization, we can collect data about Internet users, we can create semantic web analyses and generate a custom profile for each Internet user, achieving an increased interaction. Personalization methods require the most sophisticated feedback techniques and heuristic decision making.

The proposed model aims to improve personalization of sites with advertisements tailored to the Internet users' city.

The advantages of this model are the following:
• customizing advertisements by city and thus increasing the interaction of Internet users;
• increasing the number of advertisements available by means of personalization areas.

A disadvantage of the model occurs when using proxy servers. In this case, customization is no longer relevant. For example, when an Internet user from Brasov uses a proxy server from Paris, the model "sees" that Internet users is located in Paris, and will therefore customize the website with advertisements from Paris.

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