TECHNOLOGICAL INTEGRATION FOR INCREASING THE CONTEXTUAL LEVEL OF INFORMATION

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Abstract

Mobile devices and applications are becoming increasingly present in everyday life and they represent an important success factor in business. Through this work we aim to provide end users a significant increase in the level of contextual information using the Android platform for mobile application development. The idea of the "Where?" application is based on a collaborative architecture involving actors from the business (pharmacies, banks, restaurants, hospitals, etc.) and the end users as primary beneficiaries of the system. In essence, the user needs a service that will be able to locate the best deal to suit its contextual and temporal and spatial availability of the service provider. The proposed new architecture and the application have the possibility to integrate into a single system the local customer needs and business opportunities, directing the beneficiary to the most appropriate location, taking into account the custom criteria.

Keywords: GPS, business services, information level, localisation, collaboration
JEL classification: O33, M15

1. INTRODUCTION

Today, more and more clients use mobile devices like smart-phones that incorporate capabilities as phone call, written messaging, GPS and mobile internet. Also, there are many providers of geo-location that offers the possibility of obtaining additional information regarding the context in which the mobile device user activates.

The point at which we started in making this material is based on the need to quickly identify locations that can provide services needed by a user in a certain address in a given time. For example, a citizen is in a city that knows too well the location of important sites and wants to watch a puppet show. Perhaps in a "classic" variant, he would ask the various people who would guide him to the nearest theater, but theater is likely that the program does not have any show at that time. As a result, the efforts have been futile and time consuming. Another common example relates to bank bills at the counter: it often happens that in a relatively small area (e.g. a city centre) there are several points of the various banks. Perhaps the person who wants to pay the bill will choose the “nearest" bank where he will lose 25 minutes standing in line. A reasonable solution would be for that person to choose a branch located a few meters in addition to physical distance and pay quickly because at that point would not have been any customer in line.

From previous examples we can deduce that there are many situations when the decision is not optimal because the contextual information is very reduced, overlapping with the “real” level of information: the "best" bank is the one that is more "close", the "best" theater is "the next street”, but unfortunately the services that the client can use are missing, reduced or time-consuming.

Given these limitations, we propose that in this material to design and implement a mobile-based application architecture that helps the user to define a more useful information context that would facilitate more effective decision making. The model we propose assumes that both partners (customer and provider) are interested in defining the information "helpful" to the customer. Thus, the idea is based on a unique database where the service providers update their spatial and temporal data and the user, depending on the service that wants to access, obtain information necessary and sufficient to qualify that service quickly.

2. THE ARCHITECTURE OF THE PROPOSED MODEL

The proposed model takes into account new collaboration between client and supplier through a single database, using the facilities offered by mobile technologies and web services. In the following lines, we ignore the technology and we will describe a conceptual model that has the following basic elements:

- the client (the beneficiary of the application);
- the supplier / service providers;
- the provider of geo-location (mobile phone company or a web service);
- the database and associated web services;
- the internet provider.

The general architecture is presented in Figure no. 1.

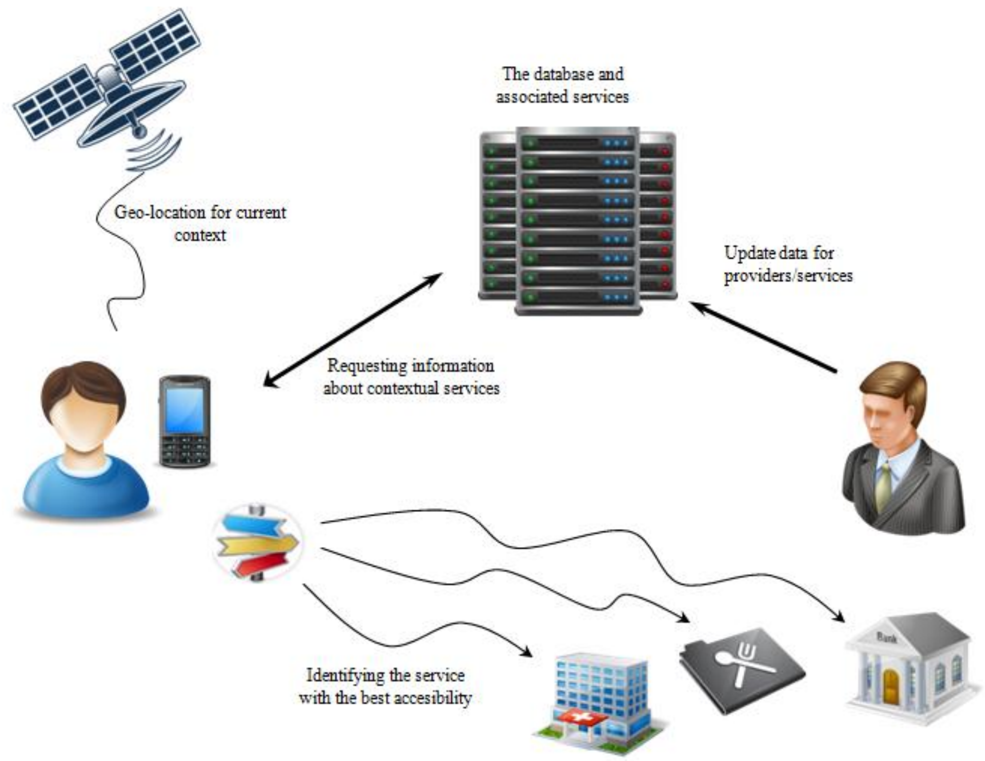

Figure no. 1 The architecture of the proposed model

As can be seen in Figure no..1, the architecture is based on the following philosophy:
• Service providers update in the database their own situation about the information context. For example, all the theatres from Iassy record their shows this week: the show name, time effect, lasting performance, room name, room GPS location, number of tickets available and so on.
• The client is on the street or in a building at a specific address and he uses the GPS application to express the desire to watch a puppet show. Based on the current location that is obtained automatically by the mobile device, it is generated the list of "valid" theaters. This list will include theaters that show the range specified by the user, and the list is ordered by distances to the locations of arts. Thus, it can be in a situation where a user close to National Theatre and Theatre Evening is first to suggest because the National is not running any show at that time. As a result, it is preferable that the user go through a few tens of meters in addition to access that service, despite of recommending the nearest location that does not "serve" him.
• The customer can use maps and the geo-location system to reach its destination as soon as possible, i.e. the supplier able to provide the requested service.
We can easily imagine a situation in the banking bill payment counters. The application will calculate the "best" branch depending on the type of bill, the physical distance and possible time waiting in line.

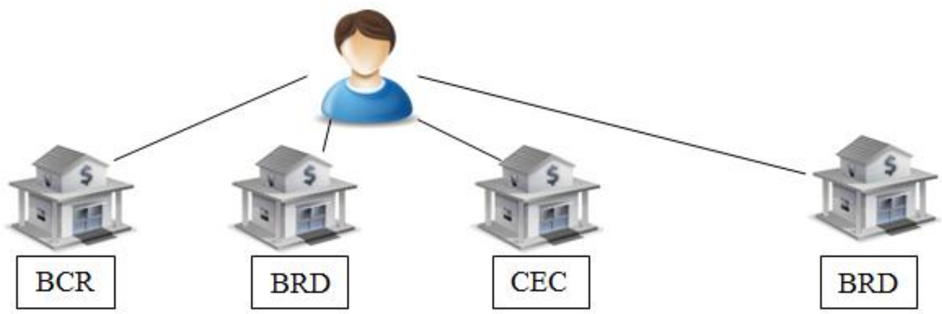

Figure no. 2 Options in the real information context

Let's suppose that in Fig. 2 he wants to pay an invoice and the user distances to the following banks would be:

- BCR: 100 meters;
- BRD1: 50 meters;
- CEC: 80 meters;
- BRD2: 150 meters.

The distances are the only available information in the context of the client. Based on this background information available, the customer would choose the first counter BRD1. But BRD does not accept the payment of that invoice (it has no contract with the issuer) and the CEC counter queue is 20 people (estimated time for waiting 45 minutes). During this time, BCR accepts the invoice payment and at the tail is only a customer (the estimated waiting time is 2 minutes).

Our proposed architecture will interconnect the customer geo-location with the banks locations and will provide an indication of banks depending on the services available and their accessibility, recommending counter BCR, although held on 20-50 meters away, provides maximum accessibility current context. As a result, the proposed architecture provides an additional level of information to the "real", immediately available.

3. THE IMPLEMENTATION - DATABASE, WEB SERVICES AND MOBILE-CLIENT COMPONENT

The database has a relational structure and it is implemented in Access DBMS. A scheme of relations between the most representative tables is shown in the following figure.

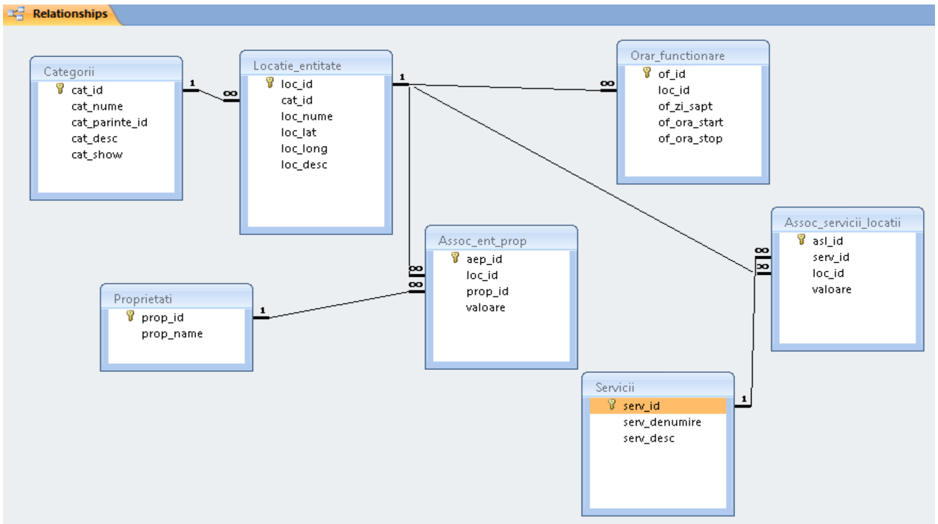

Figure no. 3 The database schema accessed by the web services

The database tables retain data on:
- Services that the user is able to access;
- The entities that can be called by the customer to access the desired service;
- Properties of different entities;
- The entities schedules.

The mobile application does not interact directly with the database, but it uses web services running on the server. The list of web services implemented for the purposes of the application is presented in Figure no. 4.

Figure no. 4 The list of the web services associated to the database

Although the mobile application is developed in Android, the web services have been programmed on the .NET platform, thus achieving the integration at the level of platforms and technologies. In this way it is provided the prerequisites for a collaborative framework.

As an example, we present a brief implementation getCategoryChilds() service which returns a list of categories of available services.

```
<WebMethod()> Public Function getCategoryChilds(ByVal id As Integer) As List(Of
CCategorie)
    If connection.State = Data.ConnectionState.Closed Then
      connection.Open()
    End If

    Dim command As New OleDbCommand()
    command.CommandText = "SELECT * FROM CATEGORIES WHERE cat_par_id=@par"
    command.Parameters.AddWithValue("par", id)
    command.Connection = connection

    Dim reader As OleDbDataReader
    reader = command.ExecuteReader()

    Dim listCategoriesChild As New List(Of CCategorie)
    listCategoriesChild.Clear()

    While reader.Read()
      Dim category As New CCategorie()
      category.catID = reader.Item("cat_id")
      category.catName = reader.Item("cat_name")
      If reader.Item("cat_desc").Equals(DBNull.Value) Then
        category.catDesc = ""
      Else
        category.catDesc = reader.Item("cat_desc")
      End If
      category.catPar = reader.Item("cat_par_id")
      category.catShow = reader.Item("cat_show")

      listCategoriesChild.Add(category)
    End While


    Return listCategoriesChild
  End Function
```

The implementation of the device is made entirely on the Android platform and uses GUI-related functionality, the call to remote web services, integration with GoogleMaps, and calculation of the optimal distance.

```
public class MapLocations extends MapActivity {
    MapView mapView = null;
    MyLocationOverlay whereAmI = null;
    LocationManager locMgr = null;
    LocationListener locListener = null;
    long idCategorie = 0;
    ArrayList<Location> FoundLocations = new ArrayList<Location>();
    long goToLocatieId = 0;

    @Override
    public void onCreate(Bundle savedInstanceState) {
            super.onCreate(savedInstanceState);
            setContentView(R.layout.gmaps);

            //getting the category id
            Bundle extras = getIntent().getExtras();
            if(extras !=null){
                    idCategorie = extras.getLong("idCategorie");
            }

            if(idCategory != 0){
                    // get categories by web service
                    new getLocationsTask().execute(idCategory);
            }

            mapView = (MapView) findViewById(R.id.geoMap);
            mapView.getController().setCenter(getPoint(47.157109, 27.588329));
            mapView.setBuiltInZoomControls(true);
            mapView.getController().setZoom(15);

            //mapView.getOverlays().add(new MpOverlay(marker));
            whereAmI=new MyLocationOverlay(this, mapView);
            mapView.getOverlays().add(whereAmI);

            mapView.postInvalidate();

            locMgr = (LocationManager) this.getSystemService(Context.LOCATION_SERVICE);

            locListener = new LocationListener() {
                    public void onLocationChanged(Location location) {
                            showLocation(location);
                    }

                    public void onProviderDisabled(String provider) {
                    }

                    public void onProviderEnabled(String provider) {
                    }

                    public void onStatusChanged(String provider, int status,
                                    Bundle extras) {
                    }
            };
    }
```

4.. USING THE APPLICATION FOR THE FINAL USER

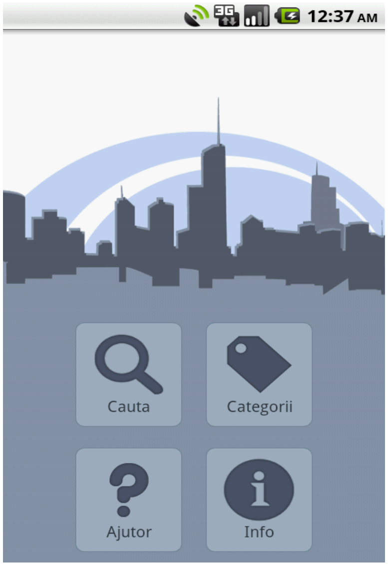

Figure no. 5 The interface of mobile application

The "Where to?" application is a useful tool for both users who need aid in spatial orientation and especially the new generation who was born with technology, traveling more than ever in different locations different and that require new technologies to meet their needs. To meet these needs, we propose an efficient model which is very simple in terms of ease of use.

Further steps illustrate the ease of use. In a first step, in order to open the “Where?” application, the user is greeted by a friendly interface that proposes him to "navigate" from two alternatives: the button "Search" or by pressing the "Categories".

1. If the user chooses to find the desired location by pressing the "Search", this will provide the following:

- presenting the most important services that users search in specific situations. At this stage the user can choose one of these categories of services that will be show for the most important locations in town (first will be the city of Iassy) providing the services it previously requested. For example, the user chooses the service "Exchange". Soon it will be displayed the locations that provide the desired service: BRD, CEC, Bancpost etc. These sites are ranked according to several criteria in order to provide a user the best possible solution. For example, the locations will be listed according to the distance, time and rating.

To facilitate the search for the desired services, we chose to include a filter button, so on the basis of keywords, we access the services more efficient.

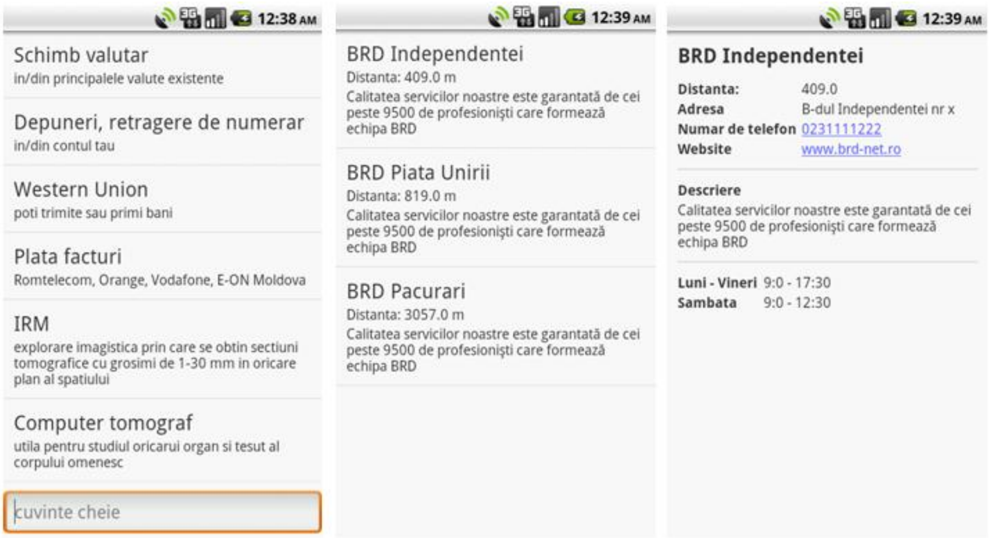

Figure no. 6 Obtaining the optimised list of the locations for the selected service

2. If users' choice is to access the "Categories", he will display a list of categories. After choosing one of these categories, will be shown another list of subcategories. After choosing a subcategory, it will display a map of the city which will provide the user's current location and locations that offer the services required by him.

For example, if the user chooses the category Health and medicine, he will show subcategories hospital and pharmacy. For the choice of subcategory Hospital, a map will appear and will include all existing hospitals in that city. These locations are differentiated on the map by red markers. On the map is also displayed the user's current location, thus providing the prerequisites of optimal choices. With a single tap on the marker that identifies a particular hospital (or any other location) will be displayed a popup showing the name and location details button. If the user clicks on this button, the application will offer any details on that location, such as distance, address, telephone number, website, description, location and services offered, hours of operation, pricing, etc.

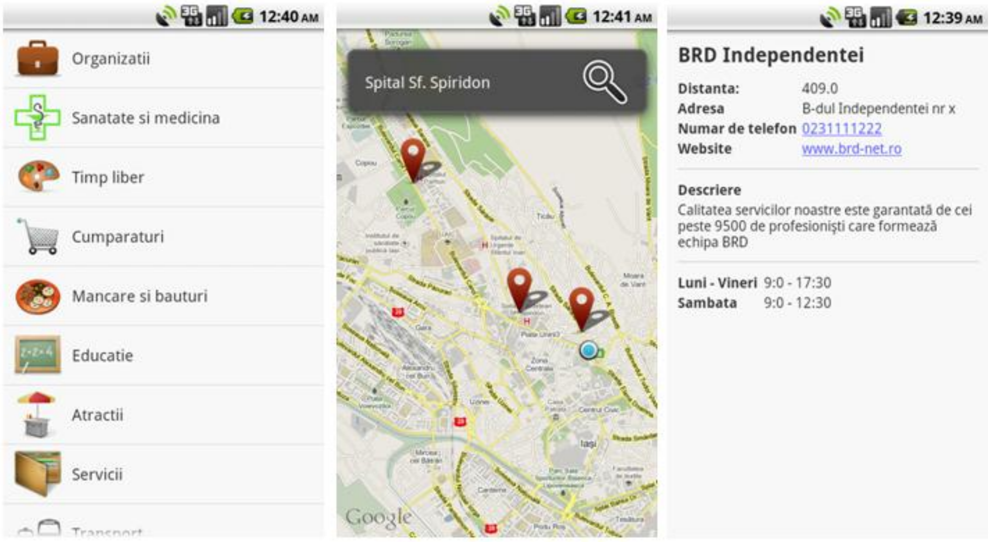

Figure no. 7 Obtaining the optimised list for the locations of the selected service

The following buttons, Help and Info, will provide a description of how the application is used, the version information of the application and its developers.

5. CONCLUSIONS, CURRENT LIMITATIONS AND FUTURE DIRECTIONS

The application we propose in this paper has several limitations caused by several factors:

• the current communications infrastructure (wi-fi access, GPS access), so the application availability depends on the operation of these services have exclusive control over which mobile phone operators;

• the availability of the providers to publish data on the locations of operation. This actually involves an effort by service providers to publish their own location data (schedules, available services, while waiting in queue, etc.).

The architectural model proposed in this paper is one that produces a robust and modern integration between customers and suppliers at business level and also a technological integration of the database, web services and client application.

As directions for the future, we plan to implement a viable and facile mechanism for the suppliers by designing dedicated web services. We believe that the collaboration such as that proposed in this material is beneficial to all the participants in business processes, leading to savings of time, money and greater accessibility to services.

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