# Development of Mobile Guide System


## Location Based Services through ArcPad

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**16 May 2011**

## Introduction

GPS integration in mobile devices is to manage touristic routes, land inventories, rescue team etc. The application allows on the field by implementing software navigation (ArcPad), integrating surveys of tourist routes based on GPS positioning, with different maps in raster or vector format. In our case we worked on an application to develop the shortest route from Europahaus to Central train station of Karlsruhe.

## Project Goal

A user who demands this type of technology is looking for more comfortable and a different way of making tourism more autonomous, more intuitive and much more information than a paper map. The aim of the project is to create an application in which to meet these needs. A development of a mobile guide system for students, which was applicable for pedestrian navigation. It will be recorded a route, waypoints, interest points, text information about the points and images of the point of Interest.

## Methodology

### 1. Background Information

We used the background information which was available in different sources to understand different steps to work with PDA. We gathered knowledge of working with the PDA by going through the E-learning tutorials form the Public folder offered by the professor Peter Freckmann from **\\ads\dfs\g\public\professoren\Freckmann**.

### 2. Deciding the route

The Route 3 (as sequenced from the Project work) Europahaus of HSKA to the Karlsruhe Central station is our route. We created the shortest route for the students who can find some landmarks relating the cheap food (university Canteen), like the cheap film (Kino) in Europaplatz, the central point of Karlsruhe (Europaplatz), Cheap Bars and restaurants for the students, Zoo which is close to the central Train station, which is necessary to know for the students for their everyday life in Karlsruhe.

### 3. Collecting the data and creating the excel sheet

A generalised overview of the route was identified through the internet search and finding the coordinates of the selected landmarks by creating an Excel Sheet. It was done whether the coordinates match with the survey through the GPS also to find several additional information relating to landmarks (opening and closing hours).

### 4. Digitizing the Route

The route was digitalized and the shape file was assigned to visualize the route in PC, because it is more comfortable to work with them on the computer (with ArcMap). The next task was to import the shape file and the original map into the Arpad.

### 5. Survey with the GPS

The route was selected through the pedestrian navigation. So we went to the every landmarks consisting of 39 points, locate through the GPS position and checking with the actual coordinates which were identified and recorded in GPS.

**Fig 1: Showing the routes from Europahaus to Central train station**

### 6. Creation of the POIs and the route

After all necessary data (coordinates, name, opening hours, etc.) about the POIs was collected and stored in a standardized way in an 'Excel' sheet, this sheet was imported into 'ArcMap' and converted into a shapefile. This shapefile contained the location and the attributes of each POI in its attribute table. The route between the 'Europahaus' and the 'Hauptbahnhof' was then created as a line feature in a second shapefile.

Because the extent of the map which was used in the sample application was not big enough to fully enclose our route, a new base map had to be created. Therefore a shapefile containing the full map of Karlsruhe had first to be clipped to a reasonable size around our route. From the resulting shapefile several new shapefiles had to be extracted, each containing a type of land use (for example minor roads, main roads, open space, lakes and rivers). These shapefiles were then loaded into 'ArcPad' together with the shapefiles for the POIs and the route. Display attributes for all the layers were then set and stored in the 'LBS_Karlsruhe' file (which is used to start the application) to ensure that the base map looks always the same. The colors which were assigned were used in the following step to create a form containing a legend.

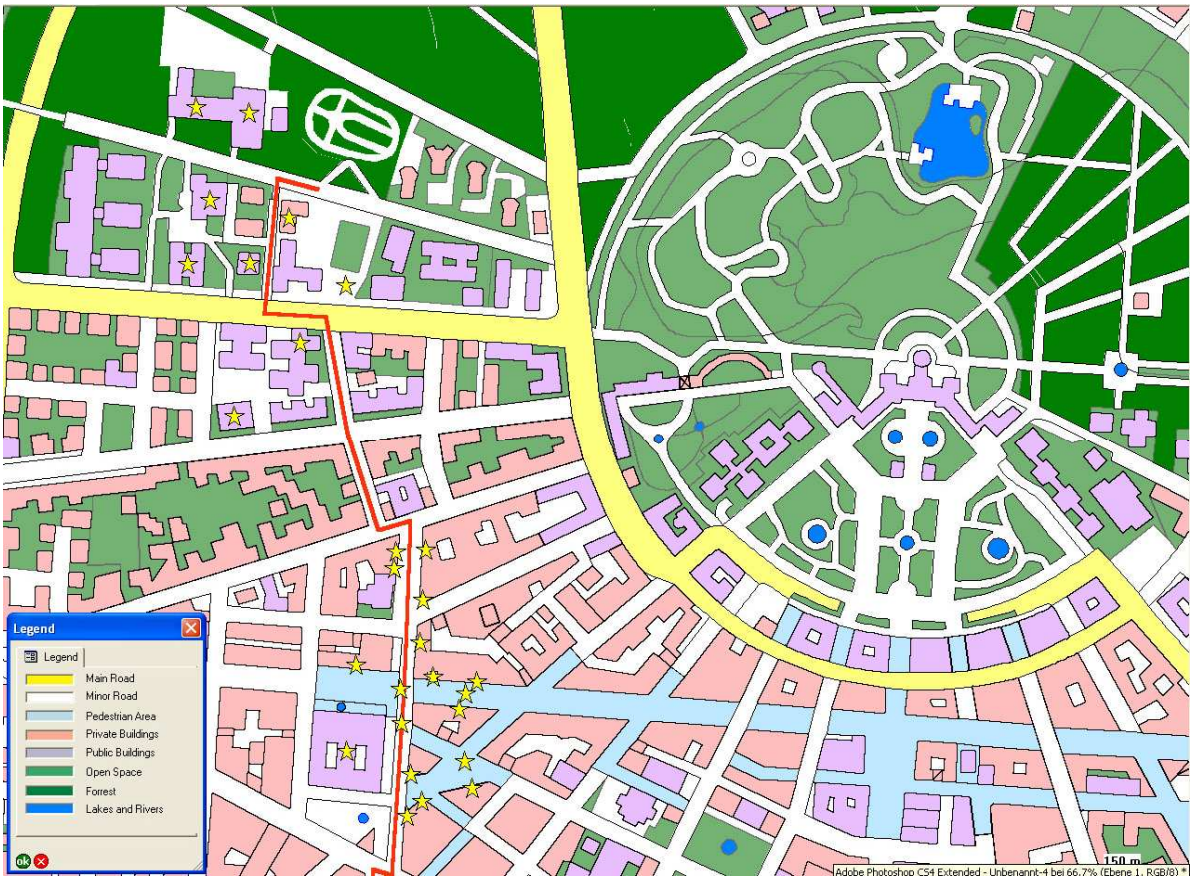


**Fig 2: Showing the landuse of Karlsruhe**

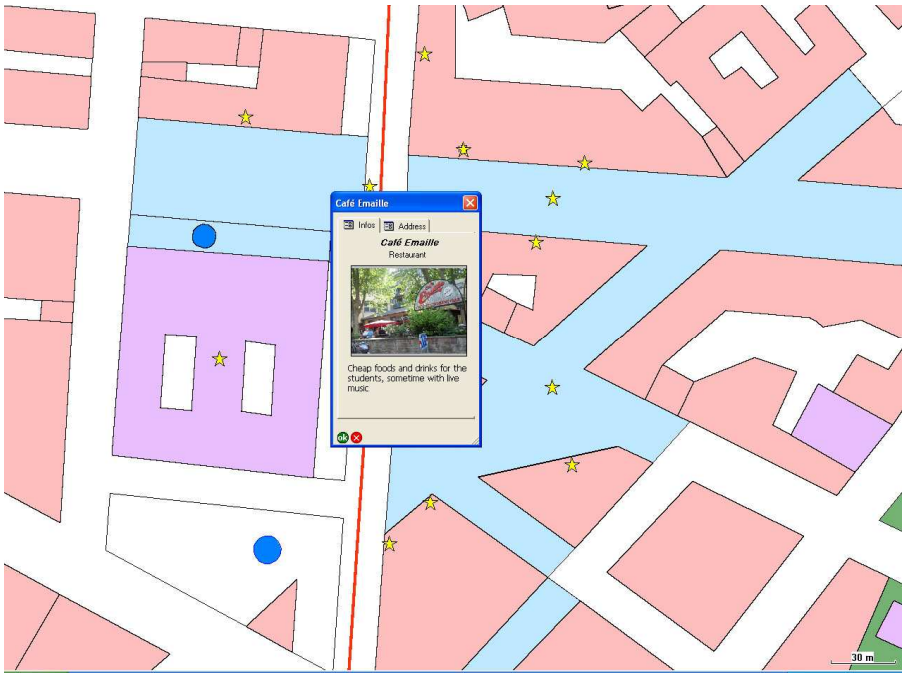


**Fig 3: Showing the Picture by clicking a single point (Café Emaile)**

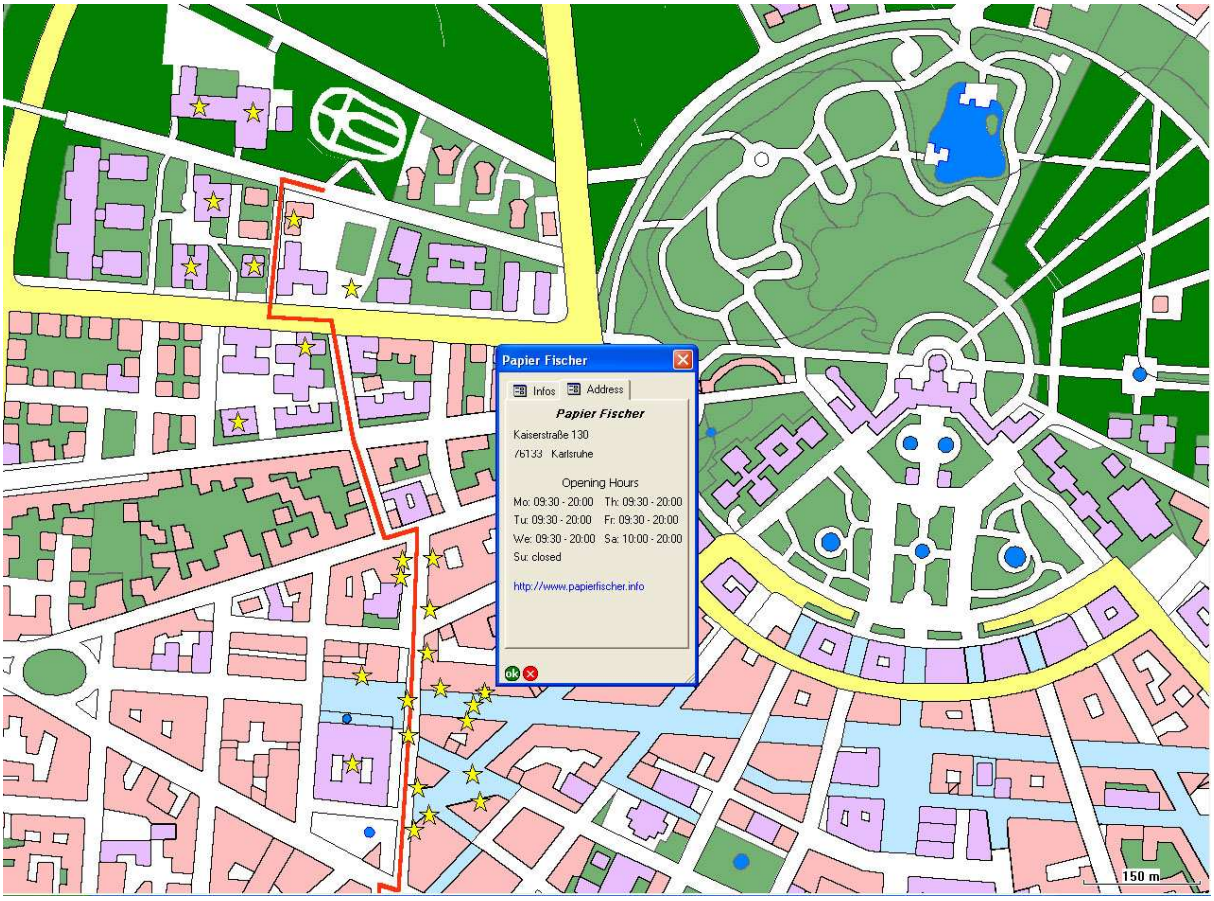


**Fig 4: Showing the information by clicking a single point (Papier Fischer)**

## 7. Creation of the application

We had access to the 'ArcPad' and 'ArcPad Studio' software – both in the long outdated version 7 – to create the LBS application for the PDA. During the development process 'ArcPad Studio' was used to create the user interface and the code to provide the necessary interactivity. 'ArcPad' made it possible to test the resulting application directly on the computer, instead of having to transfer the files to the PDA. A sample application, created by students in one of the previous semesters, was available and had to be adjusted to the specific requirements of our task.

The 'ArcPad Studio' software is relatively straight forward and enables the developer to create custom forms and toolbars. They can either be edited via a graphical representation and matching menus or by setting their values and states directly in the menu tree.
Forms can contain several pages, accessible via tabs. These pages can contain several (control) elements like textboxes, pictures and buttons. Forms are mainly used to display information about objects or to inform the user about possibilities of interaction. The contained control elements and the forms and pages can create certain 'events', which can be used to call functions in the code and thereby react to the actions of the user.

Toolbars can contain predefined or custom made tools, like panning, zooming and feature identification. The developer can add and arrange the tools he needs and create submenus for tools with similar function. Unfortunately it is not possible to customize any attribute of the predefined tools. For example it is not possible to change the language of a tooltip text. Custom tools don't contain their functionality themselves. They are basically simple buttons that call a function in the code that implements the functionality.

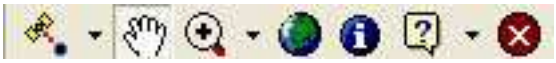

**Fig 5: simple buttons calling the functionality in the code**

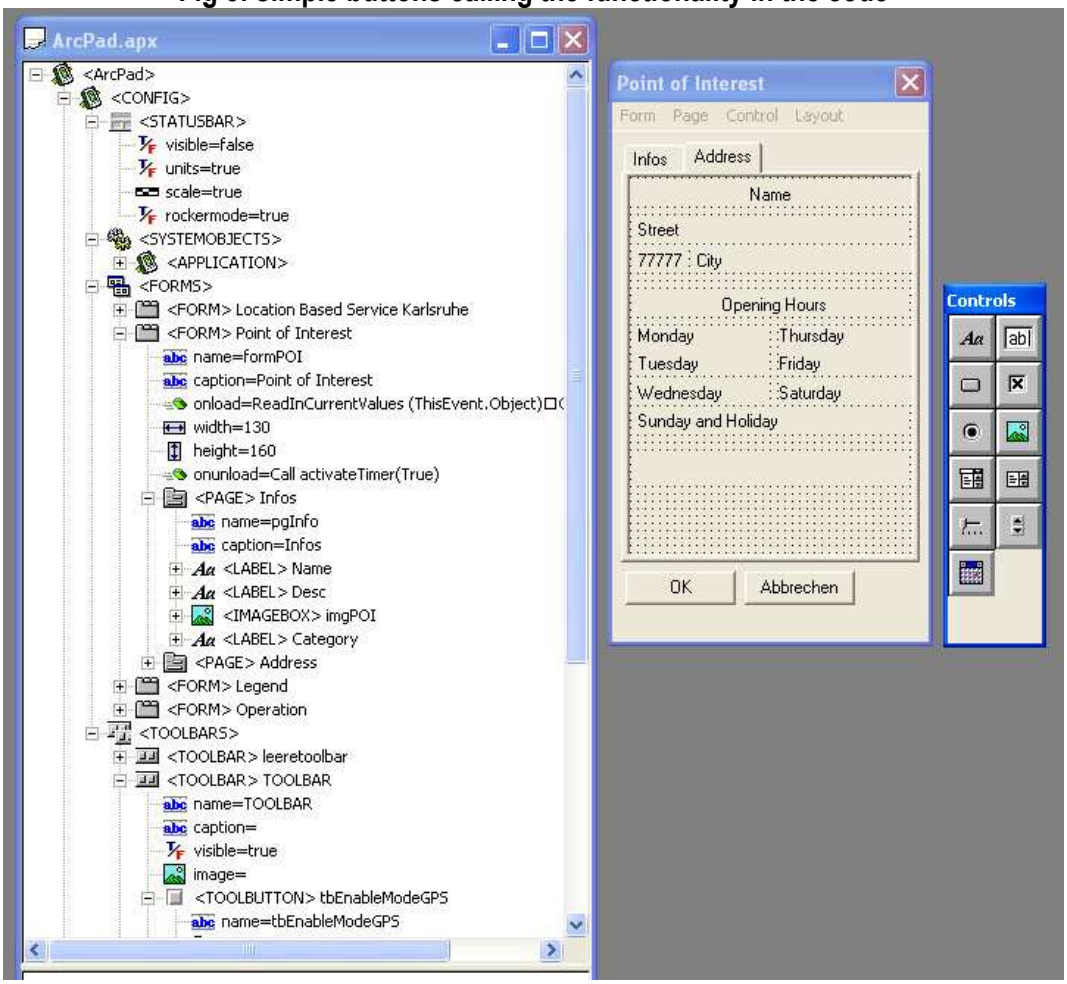


**Fig 6: Editing forms in Arcpad Studio**

The code for the application has to be written in visual basic, the location of the file containing the code is set in the configuration file which contains the definitions for the user interface. It is possible to edit the code with every text editor but 'ArcPad Studio' provides syntax highlighting which makes it easier for the programmer to create clear and correct code. The functions which were necessary to provide the user with interactivity were already implemented and only had to be adjusted to the needs of our application. More programming work was necessary to realize the data flow from the attribute table of a selected POI to the matching display form in the software. The first of the following examples shows how attribute values from the attribute table of a selected POI are stored in global variables. The second example shows how the values of these global variables are then set as the values of text fields in a form in order to display them on the screen of the PDA.

```
'Example 1
'Store values from attribute table of shapefile in global variables
Application.UserProperties("POI_id")= objRS.Fields("ID")
Application.UserProperties("POI_name")= objRS.Fields("Place")
Application.UserProperties("POI_category")= objRS.Fields("Category")
Application.UserProperties("POI_descr")= objRS.Fields("Descr")

'Example 2
'Load the values of the global variables into a form
pForm.Pages("pgInfo").Controls("lblName").Text = Application.UserProperties("POI_name")
pForm.Pages("pgInfo").Controls("lblCategory").Text = Application.UserProperties("POI_category")
pForm.Pages("pgInfo").Controls("imgPOI").Value = Application.UserProperties("POI_image")
pForm.Pages("pgInfo").Controls("lblDesc").Text = Application.UserProperties("POI_descr")
```

During the development the application should be frequently tested, since there is no real debugging functionality included in 'ArcPad Studio' and therefore it is very time consuming to search for the cause of an error. After the application is completed and was successfully tested, the created files can be copied to the PDA and the program can be started by opening the 'ArcPad' file that contains the base map.

**8. Division of workload among the group members:**

Total workload was divided among the group members. David was assigned as the Key speaker of the project. The other members were also assigned to perform several activities in order to finish the assigned task timely. The assigned task is shown below with the help of the Excel Sheet

| Task | Designed Person | Duration | Start Date | End Date |
|---|---|---|---|---|
| Background Information | David, Dilip | 4 days | 30. Apr | 03. Mai |
| Collecting GPS | Dilip | 30 mins | 30. Apr | 30. Apr |
| Creating the Excel Sheet | David, Dilip | 2 days | 04. Mai | 05. Mai |
| Digitizing the Shape file | Dilip, David | 1 day | 05. Mai | 05. Mai |
| Survey with the GPS | Dilip, David, Throdros, Nicolaus | 2 days | 06. Mai | 07. Mai |
| Taking Pictures | Theodros, Nicolas | 1 day | 08. Mai | 08. Mai |
| Fixing of the POIs and the route | David | 2 days | 09. Mai | 10. Mai |
| Creating the Applicatioin | David | 3 days | 11. Mai | 13. Mai |
| Documentation | Dilip, David | 2 days | 14. Mai | 15. Mai |

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**Remarks**

The main **advantages** of this software are:

- Perform reliable, accurate, and validated field data collection.
- Integrate GPS, rangefinders, and digital cameras into GIS data collection.
- Share data for updating and decision making.
- Improve the productivity of GIS data collection.
- Improve the accuracy of the GIS database and make it more up to date.

ArcPad contains the following **problems**, which were faced by our group:

- It is difficult to connect the ArcPad.
- Software does not fit with the change of the several attributes like font size.
- It's not possible to follow the undo/redo steps.
- No working the debug functionality, so the user has invested a lot of time to find the errors in procedure of work.
- The resulting application appears different on PDA, which is shown different in PC application.