IMPLEMENTATION OF AUGMENTED REALITY AND LOCATION-BASED SERVICES TO REGIONAL DEVELOPMENT

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ABSTRACT

This article discusses an innovative concept of augmented reality and location-based services in regional development. The aim of this article is to present the approaches that led to the creation of dynamic data of the strategic parts of community development strategy in the local action groups of the Zlín Region in the Czech Republic. In total, data from 18 local action groups, which are located in the territory of the Zlín Region, were collected. These data were transformed into a tabulated form, and a web platform (developed by the Institute of Geonics of the Academy of Sciences of the Czech Republic) was used to dynamically transform static data into dynamic ones. The output from this web platform is data that are ready for implementation into augmented reality applications (such as Layar or Wikitude) and can serve not only local action groups. Other potential subscribers are regions, micro-regions, as well as developers or citizens themselves.

Keywords: augmented reality, dynamization, location-based services, conception, regional development, tools.

1 INTRODUCTION

We can define augmented reality (AR) as an integrating certain digital information in real time and space. It can capture existing image and combine it with the information and inserts into it. Technically speaking, it is still a new system that allows us to insert virtual content into the material world and use it for real-time presentation (Gregor [1] or Maad [2]). Location-based services (LBS) can be viewed as services that enable users to find out where they are, what are the opportunities around them or all information about services and shops (Zelenka and Kysela [3]).

The tools of augmented reality and location-based services use a lot of users almost everyday. For example, viewing the land register or notifying your location on the social network. It is specific to them that they are running in a real time. Augmented reality tools, respectively location-based services represent the use of tangible elements in the landscape and their interconnection with the virtual world. The tools for this link are especially AR-based mobile applications – such as freely available Layar or Wikitude applications. The goal of the paper is to explore the possibilities of user-friendly dynamization of static data of conceptual development documents into the environment of extended reality.

2 THEORETICAL FRAMEWORK OF LOCATION-BASED SERVICES AND AUGMENTED REALITY

Anchorage of this problematic is based on a study of virtual space (Trojan [4]), wherein the object of the solution is based on networking of digital nodes. Thus, it completes Aristotle´s concept of place (Lang [5]) with Euclidean geometry and Descartes´s coordinate system. With the formulating concepts of space and place (Tuan [6]), it raises a discussion about the functioning of material perception of space in virtual space. Increasing users´ interests of cyberspace and the availability of appropriate technology forcing virtual space service providers to adapt trends and innovations very quickly. There are only a few areas where the

development is as dynamic as in the case of mobile services and AR/LBS. Users, who are largely content-conscious, enter the virtual reality due to its availability practically anywhere. Access to places in cyberspace is then realized through the interface of the physical world (mobile phones/tablets with touchscreens, keyboards, joysticks, etc.). Dodge and Kitchin [7], based on their earlier study (Dodge and Kitchin [8]), offer a typological overview of virtual sites through software code, time independence, and (geographical) localization of creating such a place. Typical for this classification is the heterogeneity of sites and the tendency to rapidly change the internal structure.

The tendency to shift activity from material world to virtual space is visible in many industries. (Zipf and Malaka [9], or Trojan [10]), where a wide range of AR applications (mainly guides) are created. An augmented reality is an environment through which spatially localizable information (created e.g. in geographical information systems) can be presented to the public. A mobile device to use this concept needs only a positioning tool (most commonly implemented with a GPS/GLONASS/Galileo chip integrated into the device) and camera, through which it is possible to identify objects´ contours of the real world. With the simultaneous connection to the Internet, virtual world information stored on remote servers can be downloaded. For its features and widespread use, the augmented reality (also due to a wide range of free applications) is dynamically evolving concept. The importance of augmented reality and location-based services documents several sources. On the one hand, the growing publishing activity (especially Anglo-Saxon) researchers, for example, published in the Journal of Location Based Services (ISSN 1748-9725), as well as mass expansion in the gaming industry (see Pokémon GO!). On the other hand, support from research agencies (e.g., Project TD03000079 Web application for the dynamics of spatial data of industrial sites in the form of location-based services). However, concrete realizations are lacking in the level of regional development, e.g. through the dynamization of regional conceptual documents. And usability exists here – surveys among potential users indicate a relatively high demand if the barrier of know-how adaptation goes beyond (Trojan and Šinogl [11], or Trojan et al. [13]).

3 METHODOLOGY AND DATA SOURCE

To illustrate the data collection, we used an extensive database of community-led local development strategies (SCLLDs) of individual local action groups (LAGs) in the Zlín Region (a total of eighteen subjects). The advantage of using SCLLD is the structured and methodically clearly anchored content and clarity that each LAG has in this strategy elements listed in the strategic section, divided precisely into key elements, strategic objectives and individual measures (in line with the methodological recommendation for creation of SCLLD issued by the Ministry of Local Development, closer to e.g., Binek et al. [12]). An overview of the local action groups used to dynamize the SCLLD is shown in Fig. 1.

In order to implement the data into the web interface, it was necessary to collect the data presented in the SCLLD prepared by the local action groups of the Zlín Region. These were always key elements and individual measures that could be used to determine positions by coordinates (latitude and longitude). From the point of view of precise localization, the measure “Develop knowledge and skills of employees and employers” was evaluated as unsuitable. Measures that had a clearly identifiable position were rewritten into tabular form. For a significant part of the measure (e.g., “Building pedestrian crossings” from the LAG strategy of Hornolidečsko) it was also necessary to identify the critical points in the village where such construction is necessary (for example in Prlov village /49.2433233N, 17.960721E/ on the traffic hub missing the transition for pedestrian between the bus stop and the local food restaurant). In addition to the location, other relevant information was searched

for each measure, which could be a reasonable demand from users (for example, a more detailed description, a website, a telephone number/e-mail to the LAG office, etc.) and which are applications of the augmented reality suitably used – see illustrative example in Table 1.

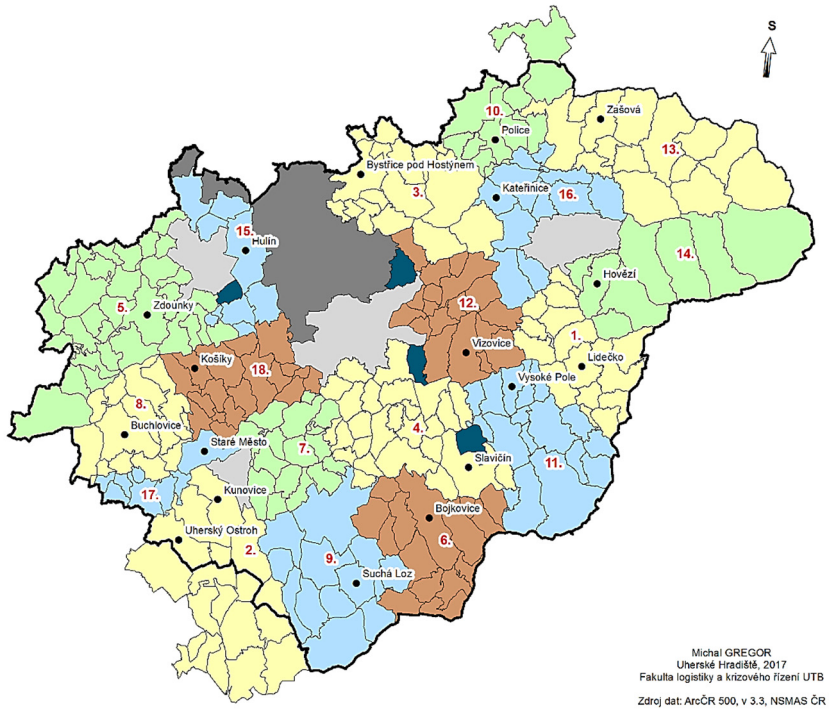

Figure 1: LAGs in the Zlín Region and their residency for the period 2014–2020.

Table 1: An illustrative example of a table.

Name of the object	Short description	Long description	GPS	GPS	WWW	Mobile	E-mail
Bystřice pod Hostýnem	Life in villages	Reconstruction of school buildings	49.399 565	17.669 7242	www.mas-podhostynska.cz	420 728 085 301	slovak@mas-podhostynska.cz
Hošťálková	Life in villages	Reconstruction of school buildings	49.356 9383	17.873 4747	www.mas-podhostynska.cz	420 728 085 301	slovak@mas-podhostynska.cz
Chvalčov	Life in villages	Reconstruction of school building	49.394 0814	17.703 5061	www.mas-podhostynska.cz	640 728 085 301	slovak@mas-podhostynska.cz

The name in the table represents the name of the member of the LAG. A short description is the short name of the priority, and the long description is the specific name if the measure listed in the strategic section of the SCLLD. Modelling from Table 1. Was “Reconstruction of school objects”, ie. The user´s coordinates will be directed to individual elementary schools in LAG municipalities.

The table containing the translated strategic parts of the SCLLD of the individual LAGs of the Zlín Region then enters the process of dynamization through the web interface developed by the Institute of Geonics of the Academy of Sciences of the Czech Republic under the project TD03000079 Web application for spatial data dynamics of industrial sites by location-based services (see e.g., Trojan et al. [13] or Malý et al. [14]). In this interface, static data is converted into dynamic data that are suited for augmented reality applications – specifically Layar and Wikitude.

3.1 Superstructure

The information shown in Table 2 are only basic information. Each LAGs who will decide to use this tool can add their superstructure information (for e.g., for buildings area, year of construction, appropriate future use etc.). This superstructure part should ensure greater demand for this tool from the side of LAGs, regions, micro-regions etc.

Figure 2: Implementation of dynamized layer SCLLD LAGs of the Zlín Region in Wikitude application.

Table 2: An illustrative example of superstructure table.

Name of the object	Napajedla
Short description	Life in municipalities
Long description	Conversion of brownfields
GPS	49.399565
GPS	17.6697242
WWW	www. http://masschp.cz
Mobile	420 604 366 154
E-mail	manager@masschp.cz
Size	2 ha
Year of construction	1932
Future use	Shopping centre

4 RESULTS

The result of the research is a dynamic set of strategic parts of the SCLLD of all local action groups of the Zlín Region. This is the first use of a web platform to dynamically build static data from a non-tourism are (the TD03000079) platform originally designed for industrial sites). Structural homogeneity of community-led local development strategies is an ideal model case in which the dynamics of static elements is useful and relatively easy. For a large part of the measures, additional data are easily traceable, after the outputs are demand (from the LAG population, but also developers or entities operating on the LAG and beyond) and a result is a functional tool in the context of regional development.

The concrete implementation is illustrated in Fig. 2. for capturing a user tablet (analogously for a mobile phone). Individual actions are displayed to users when they are moving in space using the freely available Layar or Wikitude application (in the picture), and additional contextual services (such as the ability to navigate to a location, direct dialling of the responsible person´s telephone number, sending an e-mail, opening a web page, running an add-on app, etc).

5 CONCLUSION

The paper demonstrated the possibility of dynamizing static data reflecting measures in strategic parts of the SCLLD of the local action groups of the Zlín Region. This region served as a model example for the development of information related to regional development. Into the process of dynamization were implemented key aspects of SCLLD which reflects the potential demand for data from users. Besides the inhabitants of the LAG, there are also potential developers, tourist, and representatives. Dynamization can thus contribute to raising public interest in urban development and improving the interaction between the inhabitants and the city administration. It is not excluded that the citizens themselves would get on their hands a tool, that would allow them to comment on the individual plans of the municipality. In addition to the core methodological page, the article also presented the results of a particular dynamization of data and its implementation into an augmented reality environment using Layar and Wikitude applications. For this purpose, a locally installable web platform was used to enable rapid and efficient data dynamization. The actual process of dynamization is based on the partial results of the research of the Institute of Geonics of the Academy of Sciences of the Czech Republic within the project TD03000079 Web application for the spatial data dynamics of industrial sites in the form of location-based services supported by Technology Agency of the Czech Republic (see e.g., Trojan et al. [13]).

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