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TOURISM AVL SYSTEM - TOURISTIC SUPPORT GUIDENCE ON THE MOBILITY CONDITIONS

Lecturer PhD **Pavel STANCIU**
Stefan cel Mare University of Suceava, Romania
pavels@seap.usv.ro

Professor PhD **Valeriu LUPU**
Stefan cel Mare University of Suceava, Romania
lupu_2001@yahoo.com

Abstract:
The globalization of tourism markets and technological development, unprecedented in the last decade, require repositioning of stakeholders that are directly interested in the development of tourism and travel industry. The focus is more stringent on the information services - communication and orientation – targeting with addressability to the tourists. This becomes as imperative to strengthen common standards for basic tourist information and exchange format using a hardware-software platform independent with GPS and GIS operating *systems embedded.*
Applications such as AVL integrate web components with geographic data embedded into GIS system and tourist information stored in databases managed by tour operators. Based on this concept, Tourism AVL platform develops a series of applications that collect and analyse spatial data and also offers tourist-oriented services that focus touristic attractions recommended by the system based on explicit queries and trip options made by tourists.

Key words: *AVL, Tourism AVL platform, GPS, GIS map, Tourism supply.*

JEL classification: *L86, R41, L83.*

INTRODUCTION

Information and guidance services for tourists involve the interference of three socioeconomic elements: direct benefits, related or auxiliary services and technological vectors. The design of direct services is tour operators` attribute - travel agents, hoteliers, entertainment, transport operators and integrated tourism companies - and requires tourists` post-factum active participation, following an extensive joint effort "to synthetize" attractiveness (resources, potential) and facilities (services) offered (Minciu, 2005, p.218). The contribution and the usefulness of complementary services highlight the visual impact generated by the background consisting of detail elements of the tourism product and it has an obvious qualitative impact. From a technological perspective, designing services for tourists obliges stakeholders to implement viable solutions that have an explicit level of accessibility, usability and marketing for the media, the vacant time being filled with recreation or cultural-informative activities.

Moreover, tourist information services must fulfil the function of mediation (tourist counsellor) in tourism option (Minciu, 2005, p.231) from the hospitality industry. Counselling, directing and guiding tourism, entertainment and feed-back are important landmarks of tourist consumption. These services do not confine to the written publications (posters, leaflets, brochures, and catalogues) or to online publication (portals, web pages presenting tourism and other tourist information websites) but also involve the use of modern systems (applications, specialized software, location portable devices, internet-connected mobile phones and other gadgets).

In the last decade, tourism applications and specialized software used to package with a series of gadgets - GPS, smartphone, tablet, camera - highly appreciated by tourists and industry professionals alike are gaining more ground. The widespread use of modern technology in tourism has become an element of competitive difference and strategic positioning among economic operators and a vector of orientation and online diffusion of tourist satisfaction.

Gadgets are a component of "tourist" essential individual travel plans, while applying new technologies for strengthening, promotion, marketing of standard tourist voyages and tourist consumption are vital for the survival and growth (Spencer, 2014, p.152). In this case, the performance is more commonly associated with the relationship between the services provided and their consequences - efficiency, impact, and satisfaction - and the resources needed to achieve expected results (tourist offer).

A special place in the new global equation has the access to information, availability, instant location of landmarks and the key element of communication – tourist feedback. In terms of socio-economic opportunity, accessibility is often associated with proximity or the facility of spatial interaction (Gutierrez, 2009), virtual mobility - e-tourism (Buhalis, 2003; Buhalis, Deimos, 2004, p.2; Sebastia Garcia et al., 2009, p.717). In terms of tourism diffusion in the territory, the availability consists of communication infrastructure, transport and / or opportunities associated with basic services that facilitate the ability to reach a particular location using a certain GPS transport system type (Gutierrez, 2009; Françoso, Costa et al., 2013 pp. 472-473).

Applications and services tourism related to travel industry such as SML NSA (National Scenic Area) with the integration of Infrastructure of VD (Vehicle Detector), CMS or VMS (Changeable (or Variable) Message Sign), CCTV (Closed Circuit Television), AVI (Automatic Vehicle Identification), Automatic Vehicle Localization (AVL), AR (Augmented Reality) etc. are presented as innovative accessories, smart and interesting for visitors as intermediate professional planning of tourism trips (Tenqchen, Chen et al, 2013, pp. 603-619).

The instructions specific for Information and Communications Technology (ICT) require the identification of a set of activities necessary to draw predictive tasks that describe each activity in a predefined contextual framework. For space-time framing of a vehicle and later predicting the arrival / departure to a previously established position, the automatic vehicle location (AVL) requires highlighting three main components: a detector, a filter and a control panel (predictor) (Cathey, Dailey, 2003, p. 241).

TOURISM AVL PLATFORM

Basically the AVL (Automated Vehicle Location) platform consists of the following modules: GPS receiver, board computer, radio mode, controller card for transferring data from GPS receiver to onboard computer (Figure 1). In terms of hardware, these modules can be separate or merged into a compact structure, depending on the optimal design adopted (Tsai, 2003).

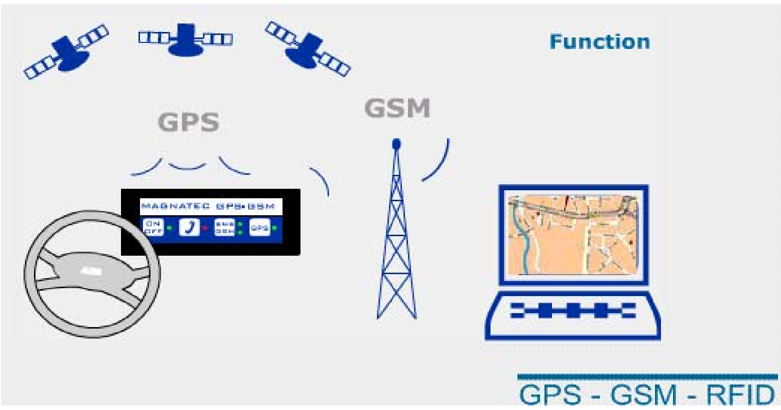

Figure 1 – AVL Platform

The AVL platform must meet several important functions, namely (Tsai, 2003):
- Reception of signals from GPS satellites;
- Calculation of the mobile position (usually a vehicle), and its longitude and latitude;

- The transfer of the positioning data of the mobile to the board computer via controller board);
- Transmission of the positioning of the mobile to the central server of the application; central server runs an application that marks the position of the mobile on GIS map;
- Viewing the positions of the vehicles, upon request, on a GIS map at the level of the central server;
- Possibility of accessing the Internet, to view on the screen the WEB page of the main application of Tourism AVL;
- A Mobile Internet browser installed;
- Transmission via Mobile Internet browser to the central server, the demand for information related to the position of the mobile at some point, in real time: BMP files, amenities available in the area: hotels, lodges, trails, sights etc.;
- Reception and display of BMP files on the screen of the platform, containing GIS information from the area where the mobile is positioned at some point; the displaying is done through C-HTML, HTML or WML pages;
- The radio channel used for AVL platform communication with the central server is GSM, GPRS or ZAPP;
- And optionally, displaying the mobile positioning data on the screen of the onboard computer.

Considering the capacity of the GSM network, the radio channel can provide 868 GSM or GPRS connections simultaneously. Due to CDMA technology, the Zapp radio channel can provide a virtually unlimited number of radio links. Clearly, the central application server that runs the database must have a connection to the Internet.

Restrictions may occur at the level of the central application due to the time required by query / answer session for access to the central server. The duration of a work session client-server, query-response depends on the length of transmitted data files from uploads and downloads and the speed of GPRS connection. The estimated time is about 1s. The tracking accuracy of AVL platform is within the error range 0-5 m.

The GPS Module, a component of the AVL platform has the following structure:

- Controller or processor;
- GPS active antenna;
- A serial interface;
- RAM, EEPROM memories.

The onboard computer performs the user interface and provides communication between the central server of the application and the GPS receiver. All stages of a work session are available in real time to the user, via the display and keyboards. It may be a PDA or it may be made around a PC 104 board. In this case, in addition to the PC 104 central unit, the construction of the onboard computer might need the following components:

- EPROM program memories;
- EEPROM memories;
- RAM data memory;
- Data/address decoders(LATCH);
- Serial interface circuit: MAX 232;
- Counters for frequency division;
- Serial interface controller;
- Power invertors;
- Logic gates;
- DC/DC convertors.

The radio unit, a component of the AVL platform will be a GSM, GPRS or Zapp mobile terminal. The AVL platform version incorporated into a board computer can be a compact module, or it might be carried out around a PC 104 (Figure 2).

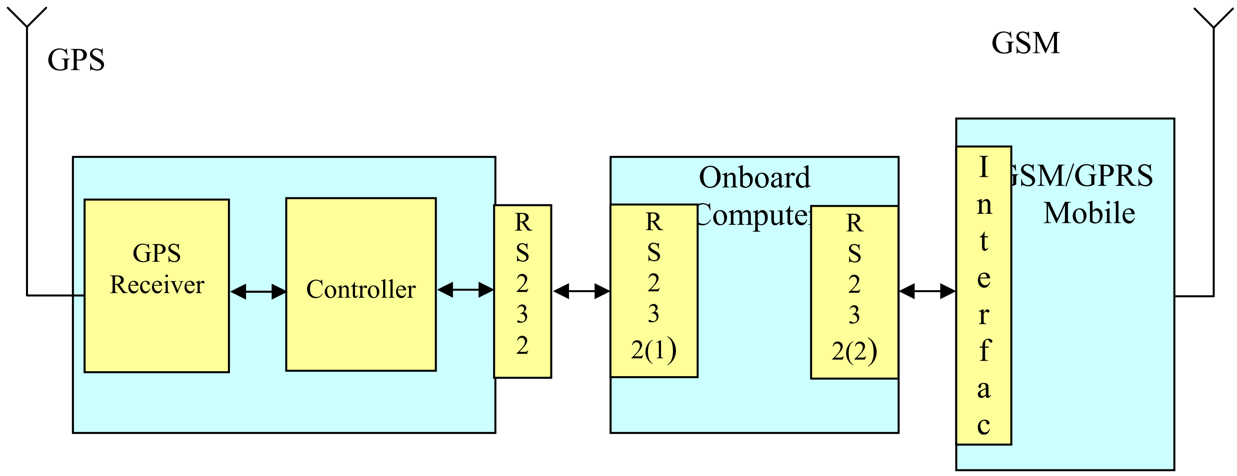

Figure 2 - AVL platform with a compact onboard computer or carried out around a PC 104 board

The sequence of commands for using the AVL - type platform is:

- ***P1:*** From the keyboard of the onboard computer, using a Mobile Internet browser, it is typed the request for services offered by the tour operator in the area.
- ***P2:*** The onboard computer sends this request to the controller, through RS 232 interface.
- ***P3:*** The controller sends to the GPS receiver a request for positioning information. Up to this point, the GPS receiver is in standby mode.
- ***P4:*** The GPS receiver calculates the position of the mobile, based on the received signal from the GPS satellites.
- ***P5:*** The GPS receiver sends the entire positioning message to the controller, which also contains information about the current time and date, the movement speed of the mobile, the number of the visible satellites etc. The GPS message usually has a length of 100 characters.
- ***P6:*** The controller extracts from the GPS message the information of interest and wraps it up in a suitable form to the RS 232 interface protocol to be transmitted to the onboard computer.
- ***P7:*** The onboard computer receives the positioning message and attaches it to a request, resulting in a short message transmitted via GSM channel to the central application server.
- ***P8:*** The GSM mobile receives from the central application server the answer on tourist services available in the area where the mobile is at some point; the information is then transmitted to the onboard computer.
- ***P9:*** The information, consisting mainly of BMP or GIF files is presented to the user on the display of the onboard computer.

In the case of a AVL platform with PDA, which acts like an onboard computer, the connection between PDA and GPS receiver plate is achieved by interface "cradle" and the connection with GSM mobile terminal is performed by Bluetooth radio channel (Figure 3).

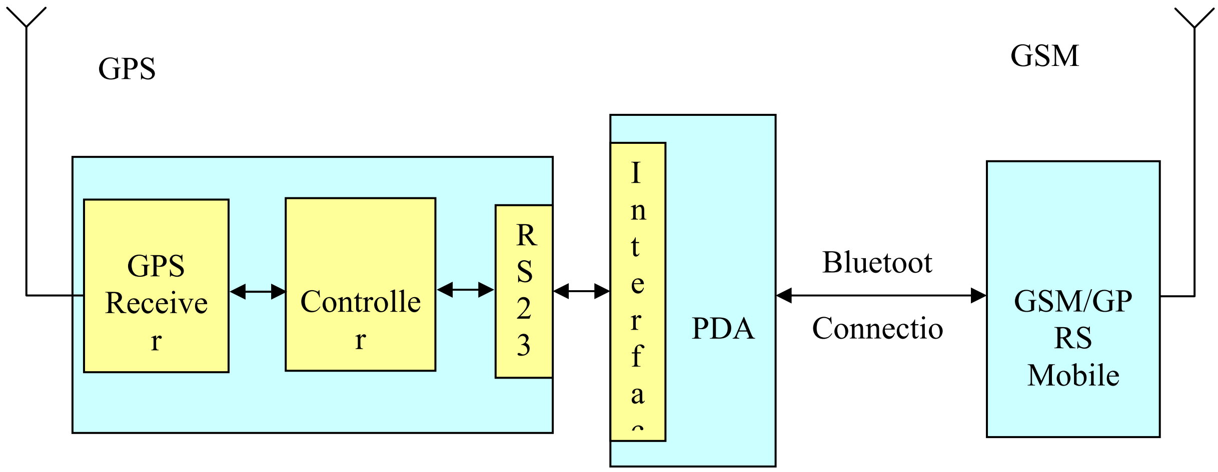

Figure 3 – AVL Platform with PDA and Bluetooth connection with GSM terminal

An AVL platform with PDA including the function of a GSM mobile phone, GPRS, having also installed the GPS positioning application is synthetically represented in Figure 4.

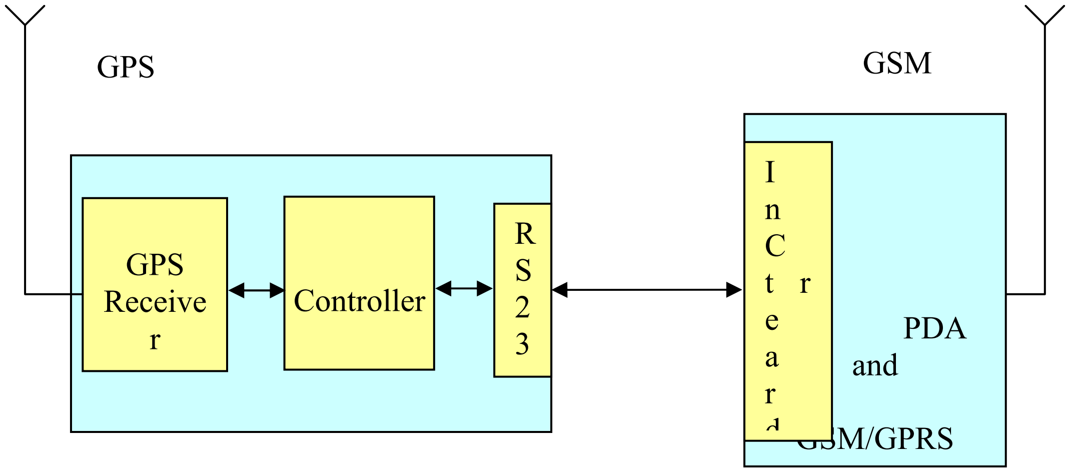

Figure 4 - AVL platform with PDA including GSM/GPRS terminal and Internet browser

If to the interface "cradle" of the PDA is attached a GPS card, then the platform AVL becomes more compact (Figure 5). In this case, the PDA is simultaneously a mobile phone and an Internet browser. For this solution it is likely to need a cable to connect the PDA to the GPS card because it is good for the GPS antenna to be placed on the car.

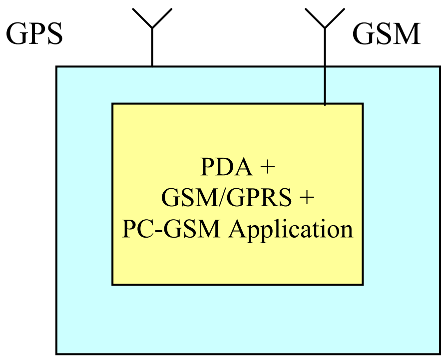

Figure 5 - AVL compact platform, PDA including all modules

An AVL platform using a ZAPP mobile terminal will have a speed of communication with the central application server that can reach about 150 kbps. It also will be able to operate more easily with HTML web pages. In this case (Figure 6), the controller (CPU) on GPS receiver performs the communication protocol with GPS receiver, with ZAPP terminal and onboard computer. Simplifying the structure through ZAPP terminal taking the board computer functions enables easy access to the Internet via CDMA channel.

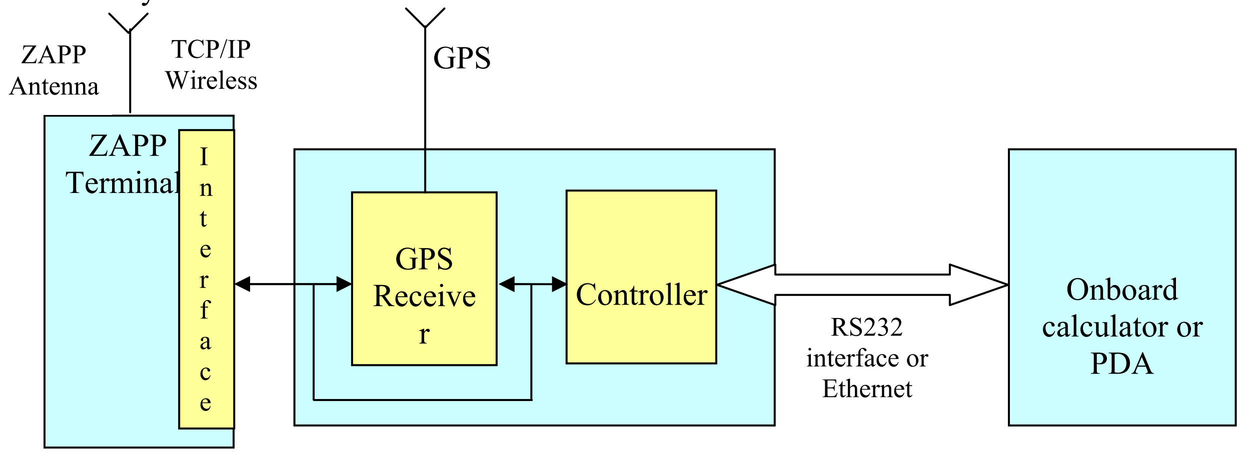

Figure 6 - AVL platform with ZAPP-CDMA terminal

In Figure 7 is shown the AVL platform within Tourism AVL application. To collect and analyse spatial data in tourism, we must consider a specific travel application and directions for use the data. These are summarized below as queries:

- What geographic data layers or themes are needed for the application;
- Hat scale is required; usually spatial data derives from existing maps or spatial photographs. The scale of the maps determines the scale of the data. For example, the scale of a regional map is not appropriate for studying a neighbourhood.
- What is the optimal/maximum size of imported files;
- How precise should be the data used;
- What data format and conversion tools are necessary;
- What supply support is agreed;
- What is the cost of obtaining data;
- If we need static or dynamic maps, having detail or scroll map facilities (*zoom/ panning*).

From this point of view, the geographic data might be divided into 2 categories:

- Geographical data base;
- Application specific data, also called thematic data.

In the case of an application which will provide tourist orientation, thematic data will focus on points of tourist interest (hotels, restaurants, museums, police stations, health care, etc.). In most cases, this information is uneven inventoried or is presented in various formats. For this reason it is desirable to require the use of a common standard for basic tourist information and an exchange format independent of the hardware-software platform.

In addition to clear and incontestable advantages offered by GPS systems, there are also a number of inconveniences caused mainly by the proprietary format, high market value of software and the high level of expertise / training required for their use in the field.

Alternatively, the current *GIS Internet* technologies combine Internet and GIS facilities available for common user, and information can be updated whenever necessary.

The AVL applications (*Automatic Vehicle Location*) are very well integrated in applications based on services in Web environment. Location technologies integrated into GIS applications allow for integrated solutions, particularly strong.

For the design of GIS subsystem of Tourism AVL system will be implemented the following functionalities:

- Determining (macro) geographical themes – forms of relief, natural resources (forests lakes, climate) and non-geographic themes (*tourist attractions*);
- Digitizing the maps and their conversion from raster format to vector format;

- Geocoding of points of touristic interest;
- Connecting vector files with tourist information databases;
- Editing thematic data;
- Generating dynamically, depending on the tourist geographical location, scalable tourist and interoperable maps;
- The displayed maps will be interactive (enabling the user to detail (*zoom*), scroll maps (*panning*);
- Navigation through hot-link maps;
- Sight searching;
- Route planning;
- Calculation of distances.

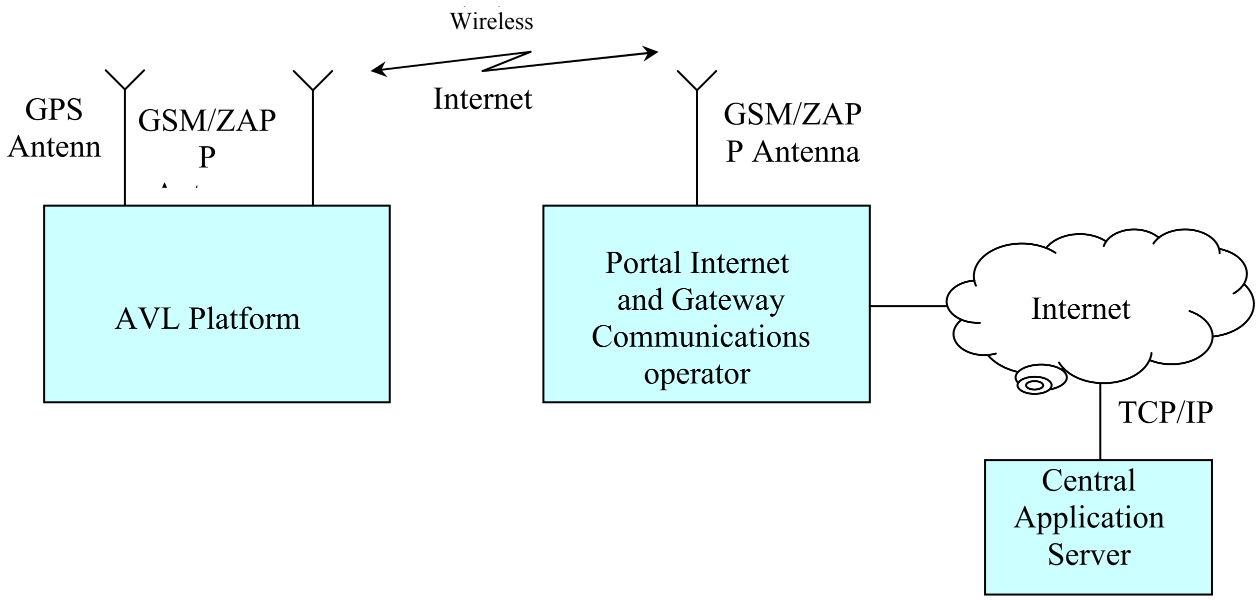

Figure 7 – AVL platform within Tourism AVL application

The architecture of Tourism AVL system enables the integration of logical geographic information stored in GIS with tourist information stored in databases. The data on points of interests are obtained by digitizing reference maps. The geometrical accuracy of the coordinates generated depends on the accuracy (quality, resolution) of the reference maps.

The GIS system allows you to create vector maps dynamically generated, which will be enriched with layers of tourist information to meet the various requirements of the users. The results of the integration of GIS data and tourist information will allow to create tourist maps with varying degrees of detail (Figure 8), including information about the location and distance, data on tourist attractions in the area and how / when they can be visited, and other nearby targets.

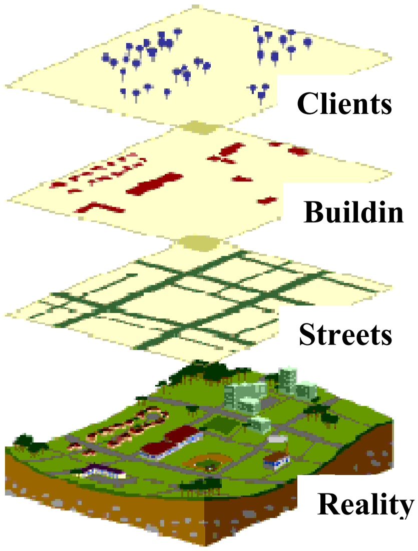

Figure 8 – Thematic maps

To those mentioned above should be added service packages customized according to the area where the tourist is located and his/her profile. Interactive maps allow zooming and panning functions. The vector format allows representation of a highly diverse range of information.

The XML technology (Extended Markup Language) will be the basis for designing an interactive GIS subsystem, whose results are not dependent on hardware-software platform for data visualization.

From the technological point of view, while they are traveling, the tourists can enjoy operating systems offered by the onboard computer of newer cars or use automatic vehicle location system (AVLS). They are increasingly used both by transport operators and other stakeholders with activities related to travel and hospitality industry (transport companies, car rental firms, etc.) to manage travel times (when traveling) and estimate arrival and departure data (Scott, 2013, p. 62-63).

CONCLUSIONS

The Tourism AVL electronic equipment with GIS embedded, intended for location, helps to identify the best route to travel, furnishes expert assistance to reach the desired destination, provides information in real time about parking availability, recommends avoiding crowded streets, highlights locations where there have been accidents or traffic jams. Through Tourism AVL system, activities such as sight searches, tourist documentation (information) and interrelation of these physical elements into spontaneous tours become integrated operations, extremely simple to achieve. The most important aspect, however, is the fact that such guidance systems will be used by tourists, salesmen and locals alike.

Similar applications comparable to a certain extent with those of a trip computer are also developed by mobile telephony operators. According to Barrero, Toral et al. (2010), the future ITS (Intelligent Transportation System) - Tourism AVL will provide mobile phones with Internet, where each vehicle will have its own IP which will allow it to create a customized digital environment inside the vehicle and also will allow vehicle-to-vehicle online communication in traffic and will encourage strong links between transport vehicles and specific infrastructure. Finally, integrated systems such as Tourism AVL have default ecological effects because they promote directly reducing fuel consumption and prevent traffic jam and help reducing car accidents. All these have consequences on the quality of tourism services and, undoubtedly, on the image of the tourist destination / organizing company / tour operator.

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