Personified information technology to support the tourist with excursion content in DAISY format

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Abstract. The paper is devoted to a depth analysis of the intellectual processes of dynamic formation of personal audio and video content for mobile information support of a user during his touristic trip. The main goal is to develop methodological approaches that are appropriate to use for designing one of the subsystems of innovative intelligent system "MIAT" (Mobile Information Assistant of Tourists) that will provide formation and processing of audio and video content that is required for individual information technology of user support during realization his excursion. The authors examined the architecture of mobile audio travel guides and algorithmic synchronization tools of their multimedia content components. Travel guidebooks in DAISY format are proposed to use as sources of multimedia content that accompanies the trip or tour. The basic requirements for mobile subsystems of intelligent information systems "MIAT" are formed, so it is responsible for dynamic personalized audio and video support tourists during realization his trip.

Key words: DAISY format, "quantum of knowledge", mobile tourist information technologies, trip support, audio guide, multimedia travel guide, dynamic content, personalized information content, tourist information technology, audio tours, sightseeing content.

INTRODUCTION

Tourism is one of the most profitable and promising sectors of business activity. An integral part of world tourism business is the domestic tourist industry. In spite of all the political and socio-economic problems of recent years, the tourism industry has become the sector of the economy of Ukraine, which is constantly, almost without the involvement of state subsidies stable increasing volumes of tourism product. According to the rating of the World Tourism Organization, Ukraine ranks 8th in the world in the number of tourist visits. The country annually attracts more than 20 million tourists (25.4 mln. In 2008), primarily from Eastern and Western Europe, Canada, USA and Japan. The rapid development of the industry generates a wide range of problems whose solution can significantly extend the range of offered tourist services. Naturally in these circumstances there is a need to create new approaches to ensure modern tourist quality, comprehensive multimedia information on relevant tourist route. A key innovation factor according to the authors is a comprehensive information and technological support for the entire tourist route, not just in its separate points.

In this context, the actual task is creating intellectual information system that provides the functions regarding selection of quality synchronized media content according to the needs of tourists throughout his journey. Problems with solving this task lies in the absence of known methods and tools of dynamic sampling synchronized media content and its voice acting by Ukrainian language TTS or announcer, in web/mobile applications.

Development of intellectual information system of tourist tour support route aimed at a comprehensive and quality meet the information and educational needs of tourists who wish to travel without the services of a guide and individually, not as a part of a tourist group. The benefits of such autonomic trip:

- Freedom to choose the route, time and form of implementation,
- The possibility of a break, change or deviation from the route in random time and independent of its continuation on request,
- Mobile multimedia information support throughout the tour (audio, photo and video materials),
- The possibility of re-listening / viewing information materials regarding the relevant excursions,
- Savings in financial guide services and assembly of travel agencies.

THE ANALYSIS OF RECENT RESEARCHES AND PUBLICATIONS

Analysis of travel software mobile guides functionality

Mobile algorithmic audio guide – it is an application for mobile user devices that combines the functions of the information guide and an audio guide and is focuses on the information-technological support during realization touristic excursions. In addition to descriptions of historical and architectural excursion monuments in audio and text formats, to get specified type of program and algorithmic applications often contain much additional background information (hours and cost of visiting attractions of important infrastructure objects, dynamic photo video materials). Mobile algorithmic application, which is the audio guide using satellite navigation technology GPS, can automatically enable relevant asset story when approaching it as a tour or an ordinary walk.

In addition, using the same technology as a mobile information technology guide can show tourist's location on the map. Thus, mobile audio guide allows you to not only listen to information materials on the tour and stories about individual objects at the time of review and search infrastructure objects, but also accurately and correctly positioning a route in an unfamiliar city.

Mobile software tourist guides are one of the most popular tourist information technology applications class today. This tendency is due to the following factors:

- rapid development of the tourism industry,
- formation of significant stable demand for quality and affordable tourist services,
- advent of affordable mobile hardware with a wide range of functionality (smartphones, tablets, etc.),
- development of information technology territorial positioning and reliable user navigation.

The authors conducted a scrupulous analysis of advanced mobile software and algorithmic applications, which are tourist audio guides.

A striking example of this class is PocketGuide - mobile tourist audio guide that can accompany tourist information in many popular cities in the world [3]. Database (DB) system contains information on over 150 historical monuments of major cities and tourist destinations.

The application uses location information received from the user using the technology of GPS. When tourist approaches to a particular place of interest, application begins to voice information. Audio tours that are listed in the PocketGuide database leading from local expert guides and include not only general tourist information, but also interesting information regarding the certain objects. In addition, the system contains a selection of audio materials related thematic hiking area intended for those tourists who prefer individual, not mass popular traditional tourist routes (see. Fig. 1).

Separately it is necessary highlight that the application provides the user recommendations for dining, and allows you to create interesting travel blog with photos/video files, formed during its implementation.

However, the system has some drawbacks. Not all functionality specified intellectual information system is available in the public domain. Free information support tours made only online at the same time the user is given the opportunity to purchase the audio tour at the planning stage travel, and later during its implementation to obtain the necessary information without Internet connection. Also specified application supports only one database of Ukrainian city - Kyiv, so it is not technological to travel in the rest of Ukraine.

Fig. 1. The user interface of PocketGuide system

Another popular application is the mobile audio guide - a project that built through cooperation of Internet users who collectively form the appropriate database/knowledge [4]. The aim of the mentioned program is to provide free audio guide service in every corner of the planet, but tours created exclusively for users of the system through the website application. Most tours voiced in English and Spanish.

During the trip AudioViator locates tourist-user and provide advice accessible audio information about places nearby. This application informative accompanies popular tours in the museum and exhibition hall and contains information about each exhibit in text, audio and photo format of files.

At the same time disadvantage of this system is unprofessional presentation of information on relevant stages, so there is quite a high probability that the information is incomplete and not reliable.

A similar public information technology service platform is izi.TRAVEL [5]. In 2011, a team of innovators from the Netherlands, together with investors from Switzerland, set a goal - to give all travelers a new tool to obtain a feeling of closeness to monuments and sites of historical and cultural heritage of civilization, creating a global, open and free system for users worldwide. In essence, the mobile information service izi.TRAVEL is a platform for creating and distributing audio tours and stories about tourist sites in audio format. The authors emphasize the service because the location and publish audio guides using the said platform is quite an effective marketing tool. Users have the opportunity to create city tours that can lead visitors to interesting appropriate exhibits, while it has some drawbacks – the information to assess interest and popularity of a tourist attraction can be quite subjective.
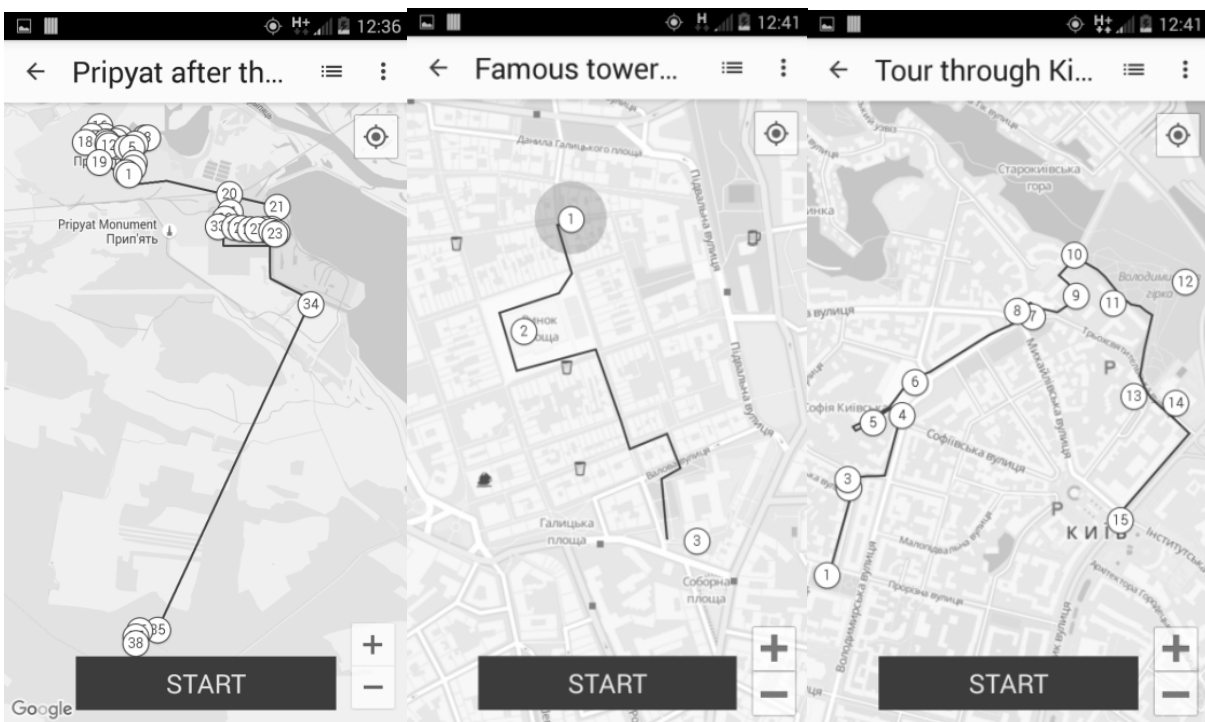

Fig. 2. Izi.TRAVEL audio tours in territory of Ukraine

The information system database contains tourist different type information content - quizzes and multimedia files (photos and video materials) designed to meet the demanding needs of the user and increasing its interest.

Among the tours, which are recorded in the izi.TRAVEL database is (see. Fig. 2):
* «Famous tower clocks», which is available in Ukrainian, English and Russian languages, the tour lasts 40 minutes and includes 3 stops,
* «Tour through Kiev», which is available in English, lasts 40 minutes and includes 15 stops,
* «Pripyat after Chernobyl disaster», which is available in English. The tour lasts 6 hours and involves 38 stops.

Quite popular tourist audio guide is a mobile application 1000Guides [6]. Like most of this class,

1000Guides combines the functionality of simple text guide, navigator and, of course, the audio guide system also incorporates dictionary and phrasebook. The feature of the system is the possibility of tourist routes forming by choosing just those points of interest that are interested in a particular user.

The system supports two modes of operation:
* Standby - sounding information takes place in the tourist arrival to the appropriate facility,
* Excursion mode - specified mode requires consecutive passage user points planned by route. The system generates messages for correcting direction of the user.

Information in text and video submissions supplements audio information. Information about the user's location formed by using GPS and GLONASS technologies. The system requires no Internet connection.

As a drawback the system has relatively small in volume database that contains travel guides for 12 major European cities, but among the positives it is convenient and additions. System's content is paid.

Table 1 shows the comparison of up-to-date popular audio-guides that were described in the article.

Table 1. Comparison of popular mobile touriat audio-guides

Mobile Audio-guide	PocketGuide	AudioViator	izi.TRAVEL	1000 Guides
General interactive map	+	+	+	+
Detailed map of tourist objects	-	+	-	-
Planed tours	-	+	+	-
Self tour forming	+	-	-	+
Professional content	+	-	-	+
Multimedia content	+	+	+	+
Tours among Ukraine	Kyiv	-	Lviv, Kyiv, Pripyat	-
Locating and navigating	+	+	+	+
Offline mode	+	+	+	+

OBJECTIVES

The problems of automated generation of semantic support the user tourist route are particularly in a synchronization presentation of multimedia tourist information (audio and video) and they exacerbated by the absence of a number of scientifically based integrated approaches to design of appropriate databases and knowledge, imperfection of preparing and classification data methods and lack of program and algorithmic tools for automated content creation and presentation. [1]

One of the key issues in this regard is the issue of sounding (listening) text materials that represent the major tour information.

In the US and some economically developed countries of Europe developed high quality speech synthesis application and screen readers. These technologies are almost impossible to transfer in the Ukrainian-environment without a deep transformation due to the nature in the voice sounding originality grammar and phonetics and sentences constructing rules.

Ukrainian language synthesis (announcer reading texts) is considered in the context of presentation and play multimedia texts, which include pictures and video files.

Known algorithmic methods do not provide a comprehensive system solution to the problem of forming synchronized multimedia database / knowledge containing information about the tourist route and do not provide effective tools for the development of an automated system for generating multimedia information support for the user to travel the route in real time.

Improving known and developing new methods of media presentation, processing and synchronization for their effective use in tourist trips is relevant scientific research and technological practical task [2].

The main purpose of the article is to analyze approaches which should be used for the design of one of the subsystems of innovative intellectual information system "MIAT" (Mobile Information Assistant tourists) that will provide formation and processing of audio and video content required for the individual personalized information technology support the user during realization it tourist excursions, and a generalized representation of the results of the author's research.

To reach those goals it is necessary to solve the following problems:

• analyze the main characteristics of current mobile software and algorithmic applications of audio guides,

• analyze possibilities for personalized DAISY format forming audio and video content of information excursions support,

• define the basic functional requirements to support rich media subsystem in the system MIAT.

THE MAIN RESULTS OF THE RESEARCH

Features of usage of DAISY standart

The analysis of the processes of forming the content according to travel routes for tourists support, that is organized by the authors, confirms the validity of choosing DAISY format (Digital Accessible Information System - available digital information system) as books that "talk" to use as a source of information in intelligent information system "MIAT".

DAISY is an open international standard for access to multimedia content. The main its developer is DAISY Consortium, which interacted with a number of professional and community organizations and formed the conceptual basis of standards in close cooperation with leading employees of a number of libraries, researchers and users. The main target group, which was led by scientific and technological innovation, consist of those with low vision and users with other disabilities. DAISY book is an multimedia content synchronizator of text, audio and graphics with advanced features of flexible navigation in it.

The core of DAISY technology is an effective synchronization tool for text, graphics and audio, that is based on the recommendations of the W3C, according to the needs of people who need to provide high-quality special way to access information.

The most common specification of DAISY version is known as ANSI / NISO Z39.86-2005 (R2012) [10] and ANSI / NISO Z39.98-2012 [11]. More than 70 participating countries that issue and disseminate books "speak" in the DAISY Consortium are registered.

DAISY formats became widespread in use when developing a specialized software and algorithmic applications for people with vision problems and content for them. The rates of the use of the format are rapidly increasing in library funds of foreign countries. Synchronized Multimedia Library is a key technology of the near future in this direction.

Among the most common problems of the Ukrainian market of publication and distribution of books that "talk" is inadequate legislation on copyright in the book meager circulation and a small assortment of books, lack of specialized equipment and recording studios.

The analysis of functionality of DAISY standard, suggests that it can be used for quality assurance wide range of requirements inherent in the process of creating a database / knowledge containing multimedia information on tourist excursions and walking trails, as it provides creating audio content using flexible mechanisms of navigation. Users can listen to a book linearly, and navigation tools make it possible to navigate through the sections, subsections, paragraphs and pages. The standard provides the ability to bookmark specific locations in the text to re-listen them.

The navigation map imposes in certain way in the audio book, so the "reader" can not only listen to the text, but to work with him to make bookmarks, notes and quickly accessed to information. DAISY books in general can be structured or unstructured. The decision to adopt such structures makes the library government or publisher who produces it.

The books DAISY standard technique used backup MP3 files, which can contain up to 90 hours of audio that tapped as the special reproducing devices and the computer on which you installed the software.

DAISY format specification uses numerous cross-references between text files XHTML, audios MP3, SMIL file synchronization and navigation control NCX. Extensible Hypertext Markup Language (XHTML) - is extensible hypertext markup language based on XML and opportunities for language similar to HTML.

The file structure of DAISY book includes content files (text and audio), synchronize files and content Book navigation controls, which are responsible for imposing the navigation scheme on the book. [12]

DAISY book can contain audio files, text files and images, or a combination thereof. [13] All books DAISY standard using a common set of file types, although some files are optional .

Almost all types of files based on XML [14]. Here are the most important types of files that are part of the DAISY book, a batch file, text file content, image file, audio, file synchronization, navigation file management, Resource file, file presentation style, file changes.
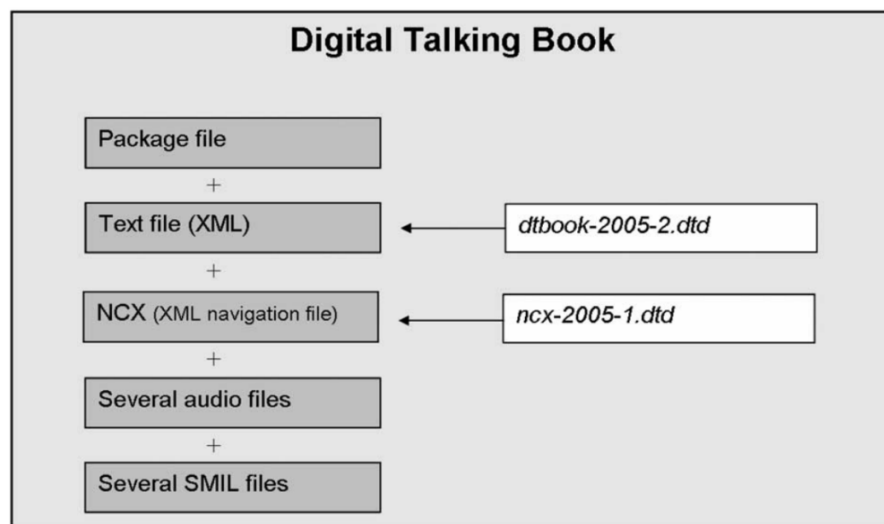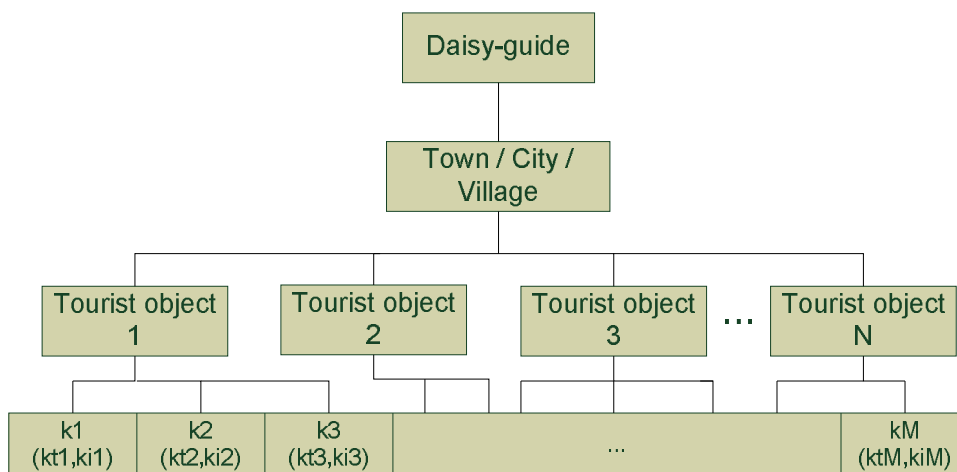

Fig. 3. The structure of a DAISY book

Fig. 4. The structure of DAISY-guide

Table 2 presents the possible types and file extensions that can be used in the manifest package.

Table 2. Types and Expansions of files that are used in DAISY books

Type	MIME Media file type	Expansions
MPEG-4 AAC	audio/mpeg4-generic	.MP4
MPEG-1/2 Layer III (MP3)	audio/mpeg	.MP3
Linear PCM - RIFF WAVE	audio/x-wav	.WAV
JPEG	image/jpeg	.JPG
PNG	image/png	.PNG
Scalable Vector Graphics, SVG	image/svg+xml	.SVG
Cascading Style Sheets, CSS	text/css	.CSS
SMIL	application/smil	.SMIL
Package file	text/xml	.OPF
DTD	application/xml-dtd	[no requirement]
Navigation Control File, NCX	application/x-dtbncx+xml	.NCX
Textual content files, dtbook	application/x-dtbook+xml	.XML
Resources files	application/x-dtbresource+xml	.RES

Technology presentation audio books previous generations much inferior technologies using DAISY format, because in this digital book can record six levels of hierarchy, which in turn makes it easier to navigate and helps to find the right section, subsection, page or even a word in the text. Undoubtedly, this is a convenient information technology to solve the problem on the formation of multimedia content database / knowledge that will contain information to provide information technology support users of various tourist routes.

Functioning features of subsystem "Multimedia guide" of system MIAT

One of up-to-date problems that face developers of intelligent system "Mobile tourist information assistant" [15] is a dynamic individual issues of formation personalized multimedia content for mobile tourist information support at the time of their tour.

Derivative objective of the study is to design information technology and algorithmic tool for intellectual formation and dynamic multimedia tour of content submitted in the application of user's mobile device (Smartphone or tablet). The originality of the proposed approach is the intellectual dynamic formation of individual personalized audio and video content for mobile information technology user support during the realization of a tourist trip. Dynamic formation of the tour content is an operational automated selection of tourist information according to the wishes of the tourist, his route of the trip. The originality of the proposed approach is that the guided tour is formed by the user in real time, taking into account the individual needs of a particular user.

Personified character is the provision opportunities to the tourist for forming independent tour route, taking into account individual needs, preferences and interests and selection of target points according to his personal interests. Mobility of filling the audio content to support sightseeing tour is to provide opportunities for tourist to get sightseeing information anywhere and at any time according to the head of information technology slogan "EVERYTHING! HERE! IMMEDIATELY! This technological mandatory requirement is the availability of Internet connection of a custom gadget.

Intelligence, primarily, is designed to provide to solve a task of automated synchronization process of multimedia content (display optional text description of the excursions of parallel support audio and video playback associate) for passing tourist route. The methods developed by the authors are intended to provide automated dynamic personalized formation of different multimedia content designed for mobile information support of the user with regard to his individual needs, wishes, velocity and the total duration of the tour as one of the basic functions of intelligent system "Mobile Information Assistant tourists" [16].

"Quantum of knowledge" are certain paragraphs of DAISY books that contain detailed structured information about tourist sights, such as architectural monuments, museums, galleries, castles, palaces, monuments, etc. (see. Fig. 4). The information given in the DAISY-guide (tourist guidebook in DAISY format), accompanied by the additional information associated with the location of various tourist sites. Each tourist sites meet several "quantum of knowledge" that differ in length of play, the type of data presentation and options according to specifications profiles. Data describing the "quantum of knowledge" are three identical dimension arrays: k – array "quanta of knowledge" about tourist sights, (kt) – an array of values corresponding durations of play of "quanta of knowledge" and (ki) – array, which recorded compliance "quanta of knowledge" individual characteristics of users.

The size of the individual tourist DAISY-guide – is limited, it may contain a set of "quantum of knowledge", the total playing time does not exceed 90 hours. In this regard, there is need for the formation of databases that will consist of several DAISY-guides, which typically

contain multimedia information about tourist sites are located in a separate village or place the interests of a particular profile. Technologically determined that a DAISY-guide contains information about the maximum number of the most interesting sightseeing points (monuments, separate buildings, squares or parks) within one city, for example c. Lviv.

Research task is formulated as follows:

Given:
- array of tourist sites, the user will visit,
- start and end point of the route,
- the procedure of visiting tour sites,
- the duration of transitions between objects and stop near them,
- Database of DAISY-guides (array "quanta of knowledge" on tourist sites, array with the time length of each "quanta of knowledge", an array of conformity of each "quanta of knowledge" to individual wishes of users)

Develop:
- algorithm for generating of information content to support tours according to user-selected individual tour route its duration and specific requests

The user of mobile software and algorithmic application should be able to choose the key points of the future of the tour route and sequence set for visit.

With the help of Google Maps tool the user selects tourist destination points and the order of their visit, and clarifies exactly what streets he wants to choose to get between tourist places of his guided tour, see. Fig. 5.

Fig. 5. Forming tourist route with the help of Google Maps tool

The main user of this mobile software and algorithmic application is ordinary tourist who, in active interaction with the system, is planning his own tourist route.

System after processing the input data and the formation of the multimedia content of the individual's wishes, the specifics and peculiarities of a particular user, provides information and technological support user on the tourist route in an audio representation and provides support for diverse graphic and video materials.

It is assumed that in addition to ordinary tourists defined system, and enjoy professional guides and experts tourism organizations for planning and development of new routes and excursions and provide quality information services. The original information-technology solutions in this development is a dynamic formation personalized content databases / knowledge system "MIAT" using different multimedia (audio and video) information content while forming a database of knowledge that is supplied in a handy format and follows the international standard DAISY (see. fig. 6, 7).
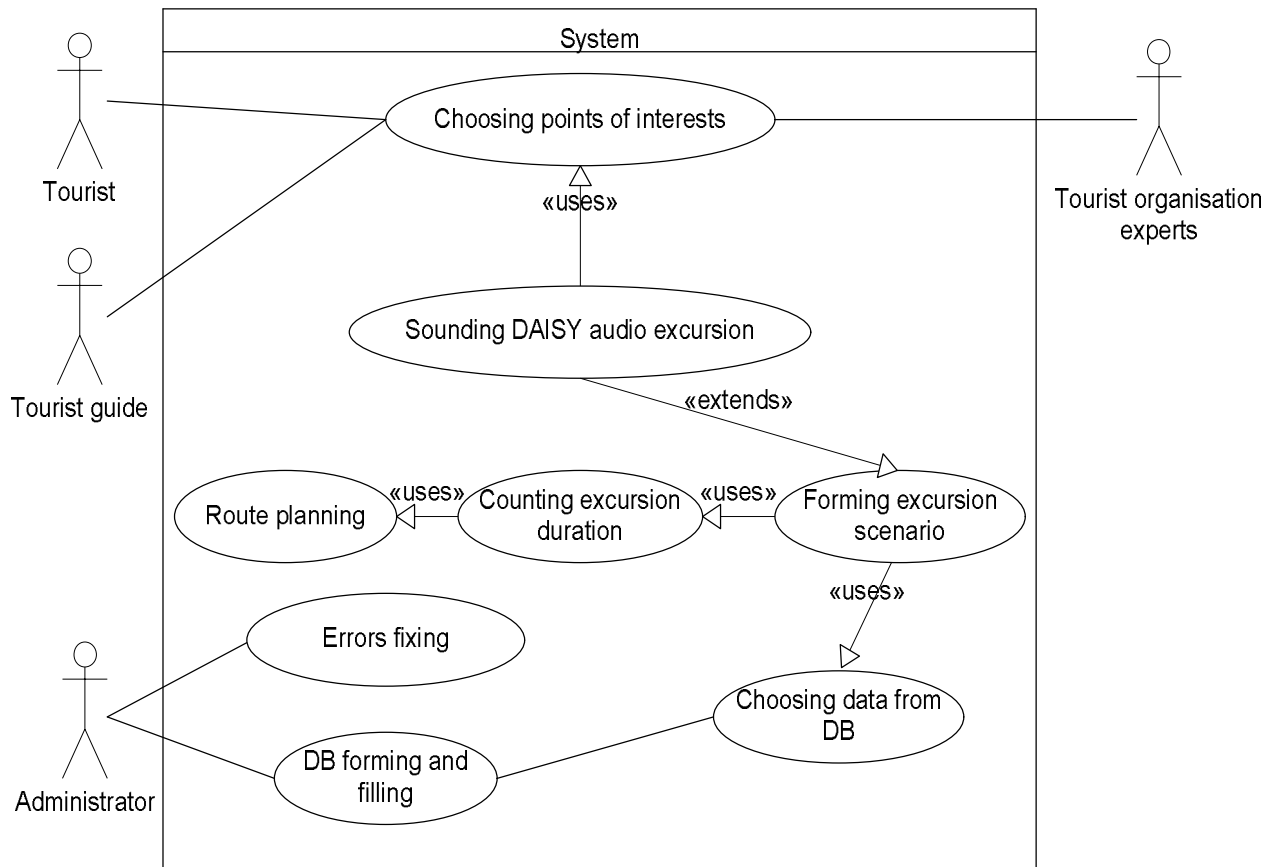
Fig. 6. UML Use-Case diagram. The roles of the user's classes

The process user interaction with the system "MIAT" presented in Figure 7. The user choses key points of the route that he wanted to visit and the approximate duration of stops during the tour.

CONCLUSION

The main purpose of the study is to analyze the approaches that are appropriate to use to design "Multimedia guide" – one of the subsystems of innovative intelligent system "MIAT" (Mobile Information Assistant tourists), which would provide dynamic personalized formation and processing of audio and video content for individual tracking of users during the tourist excursions.

Meticulous analysis of current mobile audio travel guides shows a number of important characteristics of this class of information systems and fundamental flaws in the market system in the public domain. After analyzing the tools of creation and synchronization of components of multimedia content, authors concluded that the DAISY format, that is developed for the submission and processing of audio books has the qualities necessary to create multimedia content information and technological support of the user at the time of his tour.

The designed multimedia subsystem of "MIAT" that is responsible for the dynamic audio and video support of tourist is presented in the article.

The main the target user is an average tourist, but there is also an ability to use the application by tour guides and experts of tourism organizations that want to improve the quality of services they provide. The design of the user interface satisfies the requirements of usability and quality and easy playback of multimedia content.

In general, "Multimedia guide" subsystem structure is quite extensive and high-quality implementation requires the usage of powerful algorithmic software and information technology tools.

In the future, the development of the algorithm of operation of subsystem "Multimedia guide" of system MIAT and its intelligent components is planned. The main functional load of them is to determine the characteristics of the user's profile information, forming personalized routes and provide advice on visiting some tourist sites, taking into account the specific personal wishes of tourists.
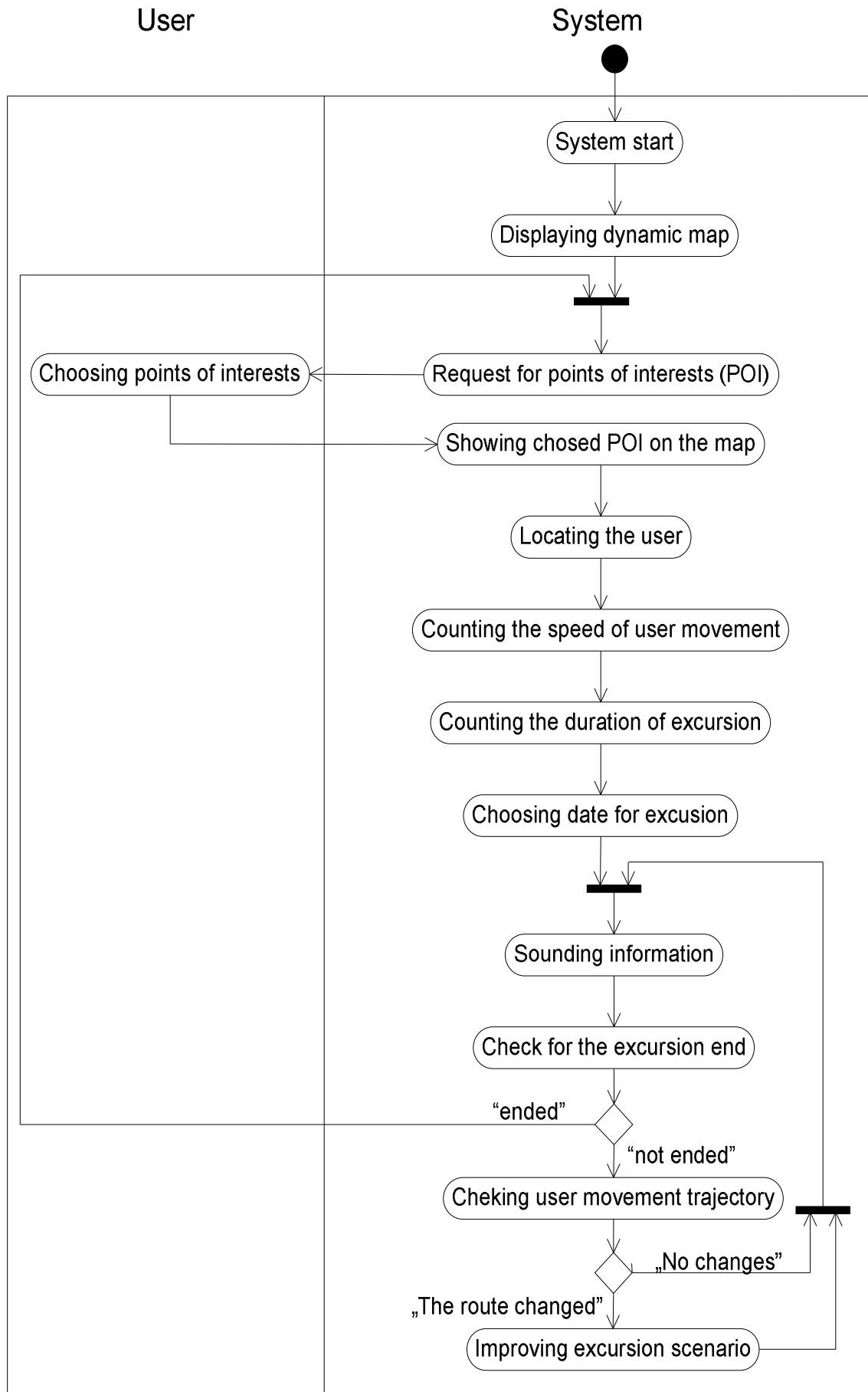
User   System

Fig. 7. UML Activity diagram. User interactions with the system

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