BOOK@HAND Bells: Mobile Presentation of the Valuable Bells of the Historic and Culture Heritage of Bulgaria

Zsolt László Márkus[1], Gábor Kaposi[1], Miklós Veres[1], Tibor Szkaliczki[1], Detelin Luchev[2], Desislava Paneva-Marinova[2]

[1] Institute for Computer Science and Control, Hungarian Academy of Sciences (MTA SZTAKI), H-1111 Budapest, Hungary, Kende u. 13-17.
[2] Institute of Mathematics and Informatics, Bulgarian Academy of Sciences (IMI-BAS), B-1113 Sofia, Bulgaria, 8, Acad. G. Bonchev Str.
{markus.zsolt, kaposi.gabor, veres.miklos, szkaliczki.tibor}@sztaki.mta.hu, dml@math.bas.bg, dessi@cc.bas.bg

Abstract. The paper introduces the mobile presentation of Bulgarian bells as the newest developments in the GUIDE@HAND mobile application family. The integration of the Web based archive on the Bulgarian bells (Multimedia Fund "BellKnow") and the mobile application family made it possible that information on bells can be presented on mobile devices. A standalone offline mobile application (BOOK@HAND Bells) was created providing multimedia information on bells including textual description (history, creator, material, height, location, description, etc.), audio files containing the sounds of the bells, photos, videos presenting the bells while being tolled and diagrams representing the acoustic characteristics of the bells.

Keywords: Mobile Application, Tourist Guide Application, Digital Library, Multimedia Archive, Cultural Heritage

1   Introduction

The number of mobile devices including smart phones and tablets increases quickly and they are always at the hand of the users. They are useful tools for presenting cultural heritage in an interactive way. They can bring cultural heritage closer to the people, impressively present the heritage values, overcome cultural and linguistic barriers in acquiring new knowledge, provide new kinds of interactions and user experiences, offer ubiquitous access to information on cultural heritage, increase their visibility and reach a broader audience than ever.

The BellKnow multimedia archive [1,2,3] is a Web-based environment where selected Bulgarian bells are documented, analysed and "exhibited" in order to make them widely accessible to both professional researchers and the wide audience. It was developed by the Institute of Mathematics and Informatics of the Bulgarian Academy

of Sciences (IMI-BAS) within the framework of the project "Research and Identification of Valuable Bells of the Historic and Culture Heritage of Bulgaria and Development of Audio and Video Archive with Advanced Technologies" (BELL) [3]. The aim of the project was to study and identify several dozens of the most valuable bells in Bulgarian churches and monasteries, as well as to develop an audio archive (using advanced technologies) for analysis, reservation and audio data protection.

GUIDE@HAND is a mobile application family providing tools and interactive services for mobile exploration of places, events, organisations, cultural objects, etc. [4,5]. The aim of the applications is to enable the visitors to change their perception of new or familiar locations, objects and motives and explore the past and present of an area in an entertaining and exploring way. The GUIDE@HAND family covers many destinations in Hungary and abroad. The applications are available on iOS (iPhone, iPad) and Android platforms. In addition to its original objective as an audio tourist guide, the GUIDE@HAND applications have been adapted to several application domains as follows: museums, events, municipalities, zoos, musicians, universities, conference series, sport teams, books, etc.

The two academic institutions IMI BAS and MTA SZTAKI have an intensive co-operation for many decades. The integration was performed within the framework of a joint IMI-BAS – MTA SZTAKI bilateral academic cooperation project entitled "Development of Software Systems for Multimedia and Language Technologies". Several mobile application were developed as a result of the cooperation:

- GUIDE@HAND Veliko Tarnovo includes a demo guided tour in Arbanasi.
- BOOK@HAND BIDL represents a standalone mobile application for presenting user generated collections from the Bulgarian Iconographical Digital Library (BIDL) [6].
- INFO@HAND DIPP is an offline mobile application providing information about the DIPP conference series for conference participants and scientists interested in the conference scope and topics [7].
- BOOK@HAND Bells is our latest development presenting information on bells.

The paper presents the BOOK@HAND Bells mobile application. The next section introduces the BellKnow multimedia archive. Section 3 introduces the functionality of the application. The last section contains the conclusions of our development.

2   Web-based Archive for Bulgarian Bells

In an attempt to answer the needs of wider bell objects accessibility, a team from the Institute of Mathematics and Informatics has developed the *Web-based archive for Bulgarian Bells* (BellKnow). This Internet-based environment becomes a place where bells of different kinds and origins were documented, classified, and „exhibited" in front of professional researchers and the public. The digital archive contains:

- The main bells' characteristics: design, form, type, geometric size, decorative and artistic scheme, weight, material, state, characteristics of chime, data about the producer and owner of the bell, estimation of its historical value;
- Digital photos and video recordings of the bells while being tolled;
- The frequency spectrum of the bells during a stroke;
- The bells' frequency spectrum after transitive process;
- Charts representing the sound fade by time, sound stream, sound pressure and other acoustic characteristics.

There are over 3 000 digital resources in archive (photos, video clips, audio recordings, diagrams etc.). The first investigations and artifacts are described in [1, 2, 3].

Organization of the BELL archive: Tree file structure; Digital files format, parameters, coding; Specific signature for file name; Additional META textual data for indexing of media files: Title (name of subject); Creator (name of digitalizer); Description (additional data); Date (date of creation); Type (type of media); Format (file format, codec and parameters); Identifier (geographic coordinates); Rights (owner of property rights).

The functionality embedded is based on ontology-based knowledge of the bell object and includes the basic activities such as creation, presentation, search and grouping of objects and information content. Glossary of terms in the specific subject area is added. It is overlapping ontological substructure and using its semantic annotations. Functionality modules are built for: optimization and automation of inputting digital resources, their metadata and semantic descriptions; optimization of search in metadata content and semantic descriptions of digital resources; comparison of the digital media resources - collate records of different types (audio, video and photo) of groups of bell objects; presentation of digital resources and objects with their semantic and meta descriptions.

Based on knowledge for each bell a passport is prepared [8]. This passport is used to document the future of all existing bells in Bulgaria. Passports are summaries of all the information gathered about an object. This includes photographs, historical reference, technical data, charts and research done in the electronic version of the passport - embedded multimedia files with recorded audio and video clips. On next figure some pages of passport of bells at "St Aleksander Nevski Cathedral" is shown.
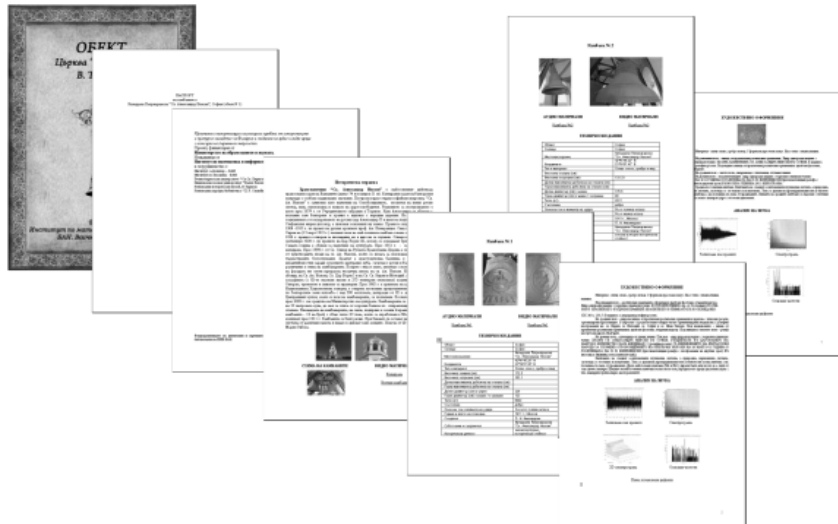
Fig. 1. Passport of Bulgarian bells

3   The Application: BOOK@HAND Bells

MTA SZTAKI and IMI-BAS decided to create a new mobile application (BOOK@HAND Bells) for presenting offline the information in BellKnow archive (Fig.1). The application will be available in two languages (Bulgarian and English).

BOOK@HAND Bells contains the following basic components:

- The *Places* function presents churches, monasteries and museums where the presented bells can be found.
- The *Bells* function provides detailed data on bells such as description, data sheet, photos, acoustic characteristics, etc.
- The *Explore* function helps in exploring the locations of the bells by using an interactive map.
- The *More* function contains some general setting options of the application (e.g. language, selecting online or offline map, update, etc.).
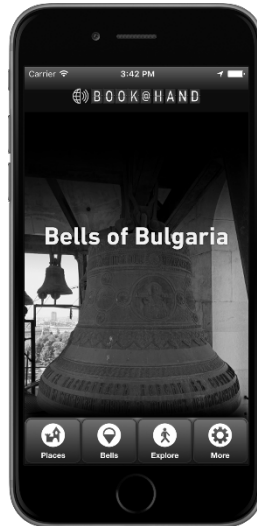
Fig. 2. Opening screenshot from BOOK@HAND Bells.

Let us consider the main functions one after the other. The *Places* functions contains a searchable list of locations (churches, monasteries, museums etc.) whose bells are presented in the application (Fig. 3). The list of the places can be grouped into categories or sorted by their distance from the current location of the user. After selecting a location, another list is presented where the items refers to the general information on the place and the bells located in the place. The general information describes the location, presents photos and introduces the history of the place. The location of a place can be shown on an interactive map after pressing the "Map" button at the bottom of the screen. The "Navigate" button helps in finding the route from the current location of the user to the place.

Fig. 3. Screenshot from function Places.

The *Bells* function presents the searchable list of all bells contained within the application (Fig. 4). The list contains a thumbnail of a picture on the bell, its ID, the location and the distance from the current location. After selecting a bell, detailed multimedia information appears on it which contains photos, videos, sound, diagrams on acoustic characteristics, data sheet including type, material, weight, height, diameter, location, date of creation, creator, etc. and textual description.

The application contains six different types of diagrams representing acoustic characteristics in time and frequency domains: waveform, spectral plot, spectrogram, 3D spectrogram, partials and pitches.
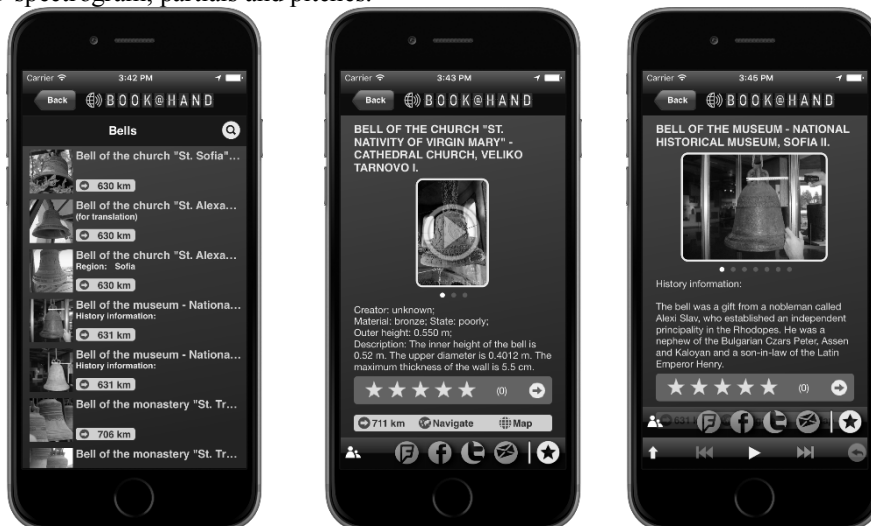

Fig. 4. Screenshots from function Bells.

The *Explore* function presents an interactive map which helps to find the sites of the bells presented by the application if the user intends to visit them. Online or offline maps can be used depending on the selection of the user, therefore, you do not have to pay for the Internet (e.g. roaming). The interactive map shows the current position of the user and the places where the bells can be found. After selecting the icon denoting the location of a bell, the application displays its name and short description on a small panel over the map. Detailed information is presented on the screen when the user selects the panel.

Several general tasks related to the application can be accomplished in the *Settings* function (Fig. 5):

- change language,
- update the application and the content,
- switch between online and offline maps and download offline maps,
- connect to 3G network,
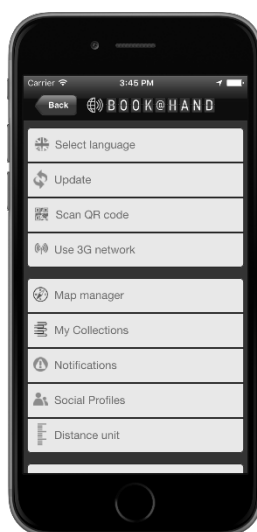- display "About" screen containing general information on the application.

Fig. 5. Screenshots from function Settings

4   Conclusions

The development presented applies mobile devices for presenting information on Bulgarian bells available in a digital library. The people can get the information about the bells through their own devices (smartphones or tablets) at any time and any place. The application presents the content offline, that is, the user does not need Internet connection to see the content on mobile device after installing the content.

The application opens new channels to reach a broader audience with the content on bells. Our experiences gained in mobile application development could be successfully exploited in other collections related to bells, and we are looking for further contents.

References

1. Bogdanova G., Todorov T., Noev N., Semantic Model of Digital Resources of Bulgarian Bells, Mathematica Balkanica, NewSeries Vol. 25, 2011, ISSN 0205-3217, Fasc. 5, pp. 483-490, 2011.
2. Noev N., Organization and Security of the Audio and Video Archive for Unique Bulgarian Bells, Mathematica Balkanica, NewSeries Vol. 24, 2010, ISSN 0205-3217, Fasc.3-4, pp. 285-291, 2010.
3. Noev N., Approaches and Methodologies of Creating, Storing, Presentation and Protection of Digital Resources in the Field of Cultural and Historical Heritage via Technologies Based on Knowledge, In: Luchev, D. (ed.). DiPP`15 International UNESCO Conference, Veliko Tarnovo, Bulgaria, 28-30 September 2015. Innovation and Culture – Regional Problems and Solutions. Workshop Proceedings. IMI-BAS, Special Edition, pp. 19-28, ISSN: 1314-4006, 2015.
4. Márkus, Zs.L., Wagner B. GUIDE@HAND: Digital GPS Based Audio Guide that Brings the Past to Life. In the Proceedings of International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage, Vol. 1, No 1, 2011, pp. 15-25.
5. GUIDE@HAND http://guideathand.com/en/index
6. Márkus, Zs. L., G. Kaposi, T. Szkaliczki, D. Luchev, R. Pavlov, BOOK@HAND BIDL: Mobile Exploring of the Bulgarian Iconography by Using Panorama Pictures, UNESCO International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage, September 28-30, 2015, Veliko Tarnovo, Bulgaria, pp. 109-120.
7. Márkus, Zs. L., G. Kaposi, G. Szántó, T. Szkaliczki, Z. Weisz, W. Routsalainen, D. Luchev, R. Pavlov. INFO@HAND: Mobile Application for Conference Series, UNESCO International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage, September 28-30, 2015, Veliko Tarnovo, Bulgaria, pp. 219-226.
8. Trifonov T., Dimokov G., Bogdanova G., Study and passporting of unique bells of historical and cultural heritage of Bulgaria and creating audio and video archive with the help of modern technology (in Bulgarian), The Sixth National Scientific Conference "Libraries – Reading – Communications", Veliko Tarnovo, 15-16.11.2007.