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ALL THE WORLD IS A MUSEUM: ACCESS TO CULTURAL HERITAGE INFORMATION ANYTIME, ANYWHERE

Matthew Nickerson
Southern Utah University
U.S.A.

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Abstract (EN)

Many museums around the world rent audio players to their visitors to provide automated tours delivering pre-recorded information about their exhibits. Though generally pleased with their patrons' responses to automated audio tours museum administrators find that hosting them can be expensive, time consuming, and frustrating. Ongoing advances in mobile wireless technology may provide an alternative to the current cumbersome method of renting sound players to museum visitors. Many patrons bring their own "digital sound player" with them in the guise of their personal cell phone. As cell phones proliferate and the price of calling plans falls cell phones may present a viable alternative to current audio tour systems. History Calls was a recent experiment using VXML technology to deliver an automated audio museum tour directly to patrons' cell phones. The success of this test suggests many possibilities for broadening the scope and creating an audio support for the cultural heritage, and though enlarge the audience to a whole town and the whole world, wherever wireless phone services are available.
Keywords: Cultural Heritage, Automated Tours, VoiceXML, Wireless, Cell Phones

Zusammenfassung (DE)

Viele Museen mieten ihren Kunden Audiogeraete um ihnen automatisierte Touren anzubieten. Diese Touren tragen bespielte Auskunft ueber ihre Ausstellungen vor. Obwohl die Museenverwalter mit diesen Touren im Allgemein zufrieden sind, kommt es ab und zu vor, dass die Touren sehr teuer und frustrierend sind, und dass sie viel Zeit in Anspruch nehmen. Fortschritte in der mobile wireless Technologie werden vielleicht Alternative zu der heutigen Tour Darbietungsmöglichkeiten ermöglichen. Viele Kunden bringen ihre eigenen "digital sound player", das heisst ihr Handy, mit sich, als sie die Museen besuchen. Als Handys sich verbreiten und billiger werden, werden sie vielleicht einige der heutigenMethoden ersetzen. Vor kurzem gab es einen Versuch, der sich „History Calls" nannte, der die VXML Technik anwandte, um Kunden eine automatisierte Tour anzubieten, in der das Audiogerät ein Handy war. Der Erfolg dieses Versuchs schlägt vor, dass es viele Möglichkeiten gibt, automatisierte Touren zu veranstalten, wo Handys die gegenwärtigen Audiogeräte ersetzten.

Résumé (FR)

De nombreux musées autour du monde louent des guides audio à leurs visiteurs, afin d'offrir des parcours audio automatisés délivrant des informations préenregistrées sur leurs expositions. Toutefois malgré l'appréciation générale du public envers ceux-ci, les administrateurs des musées estiment qu'il est trop coûteux de les héberger, et qu'ils représentent une perte de temps, et sont trop frustrants. Les avancées actuelles des technologies en matière de téléphones sans-fil pourraient offrir une alternative à la méthode actuelle, trop complexe, de location des guides audio aux visiteurs des musées. Certaines personnes amènent avec eux leurs propres guides audio incorporés à leurs téléphones portables. Au regard de la prolifération des téléphones portables et les projets de baisse des prix d'appels, ils pourraient représenter une alternative viable aux systèmes des guides audio. History Calls fut une expérience récente utilisant la technologie VXML afin d'offrir la visite audio automatisée d'un musée directement sur les portables du public. Le succès de ces tests ouvre de nombreuses possibilités afin d'élargir les perspectives et de créer un support audio destiné à l'héritage culturel, et ainsi d'élargir le public à une ville entière et au monde entier, partout où l'on peut trouver des services de téléphonies sans fil.

Mots clés : héritage culturel, guides automatiques, voix XML, sans fil, téléphones portables.

Background

Automated audio tours are a popular resource at many cultural heritage sites around the world. These types of tours were first introduced more than two decades ago using personal audio cassette players. Many patrons enjoyed these "personal" tours allowing them to experience sites more privately, without a human guide or docent, and letting them move along at their own pace. Typically a patron would rent a player for a fee and then follow a proscribed route through the exhibit accessing the audio information periodically at predetermined locations. These types of audio tours were very successful and through the years they became regular features at museums all over the world.

In the 1990's the technology improved as museums began to employ digital files and players. Automated tours incorporating digital sound were no longer held captive by the sequential nature of analog tape. Patrons could wander through exhibits accessing information in any order they pleased. Using digital players the private and personal nature of automated museum tours increased dramatically and the popularity of this service continues to rise. (Martin, 2000)

Though popular with patrons, managing these types of tours is a major undertaking for the cultural heritage institutions that choose to employ them. The digital players for audio tours require constant maintenance for repairs, recharging, updates, and replacement. Whether the service is provided solely by the institution or is shared/sub-contracted with a private provider, the upkeep of automated audio tour machines is time-consuming and expensive. Respondents to a 2001 survey of museums indicated the largest disadvantages of automated tours were installation costs and the challenges of equipment malfunction (Smith, 2001).

This query, posted by a museum professional to a museum e-list hosted by The British Interactive Group, reflects some of the most common fears and frustrations of museum professionals when considering an audio tour,

> "I've heard of some bad experiences from users of this sort of kit - hard to use/control from visitors point of view, easily broken/lost from the organisations point of view. I would be really grateful to hear from anyone with good experience of a particular system. Or bad experience/systems to avoid. Also management of them - a deposit system? Charging?" (British Interactive Group, 2000)

Introduction

The main source of cost and frustration with maintaining a museum audio tour system is the rental and continuous upkeep of the audio player hardware. Large exhibits can require hundreds of these machines. Thousands of patrons of all ages, interests, and technological know-how rent and use the players, carrying them throughout the museum or gallery every day. Commercial vendors have developed heavy duty players but accident, careless handling, and absent minded patrons still result in damage and loss. Exhibit information is stored directly onto each machine so updates must be accomplished individually. Sophisticated storage racks can facilitate the updates and recharging *en masse* but maintenance is still a costly and time consuming operation.

In reviewing this important and popular museum service it seems that one obvious way to alleviate much of the time, cost, and frustration associated with hosting audio tours would be to get museums out of the player rental business and distribute the tour through the patron's own machine. This move would not only allow museums to concentrate on what they do best, the content, but could also broaden the scope of the service to include outdoor venues and city-wide, country-wide, or even world-wide tours that would be very difficult under the rented player paradigm.

Technological advances over the past few years now make this a viable option. Hand held wireless devices of all shapes and sizes are already accompanying museum patrons on their visits. Why not capitalize on the most ubiquitous of these machines by delivering automated audio tours directly to visitors' own hardware: their personal cell phones?

VXML

The growth and popularity of cell phone technology is astounding. There are an estimated 1.5 billion mobile subscribers worldwide with 2004 sales estimated at 648 million units (ITfacts, 2005). With the widespread availability and popularity of wireless telephones this technology seems a logical option for testing a new method for audio tour delivery.

This case study describes a proof-of-concept project for delivering automated audio museum tours via visitors' cell phones. Based on its success in commercial applications we selected VoiceXML (VXML) as the central development tool for the project. VXML is an XML-based markup language designed specifically to implement interactive voice dialogs. Its main function is to describe the user interface, that is, the exchanges of requests and information between the caller and the application. These exchanges, or dialogs, facilitate communication between two very different world-wide networks: the telephone system and the Internet. VXML dialogs feature several inputs/outputs including synthesized speech, digitized audio, voice recognition, and DTMF (touch tones). VXML dialogs are described by documents (programs) that reside on a Web-server and work in concert with a voice server. The voice server receives/translates voice input and also creates computer synthesized voice messages (Larson, 2003).

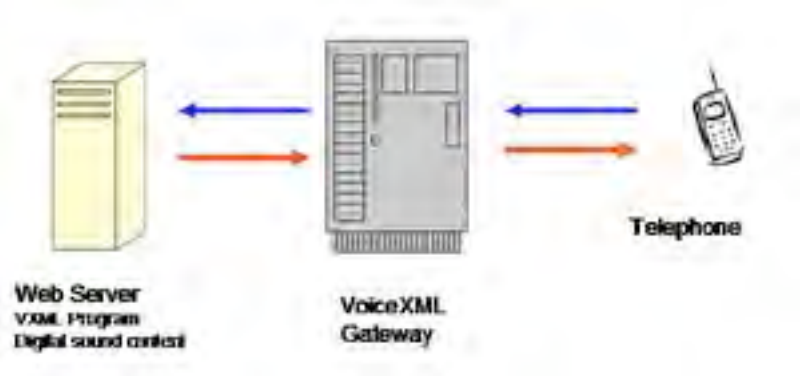

Figure 1: Interaction of Web server, voice server, and telephone

The gateway on the voice server allows these inputs/outputs to be processed through standard telephony technology. The gateway is the bridge between the phone system and the Web-based VXML dialogs. The voice server is the second key component in a VXML system. Though VXML is an open language, to build a voice server usually requires the licensing of proprietary systems such as voice recognition software and voice synthesis engines. A simpler method for acquiring this type of voice capability is to purchase a turnkey system several of which are currently on the market. There are commercial service providers as well that host VXML applications either in full or linked to a private Web server. As the use and need for VXML grows more commercial options will be available to developers.

The voice recognition process within the voice server is simplified through the creation of VXML grammars. A VXML document defines a grammar for each point in the dialog, enabling the speech recognizer to work very fast and efficiently. The grammar defines a finite vocabulary specific to the VXML document and its application preparing the voice server to respond to only a few words rather than thousands.

The ongoing development and sophistication of both grammars and voice servers/software enables developers to create multilingual systems. More complex tours can deliver content in a variety of languages either selected by the patron or keying off the response to an introductory greeting.

History Calls

A VXML system, as described above, was used to create an automated audio tour for an exhibit of historic photographs in the gallery space at a university library. The twenty photographs in the exhibit were hung in traditional museum fashion. Creation of the automated audio tour followed a four step process: 1) research, 2) preparing the audio, 3) creating the VXML document, and 4) linking to the voice server.

1. Research

Substantial research was conducted to learn about the people and events depicted in the twenty photographs in the exhibit. The photographs covered 100 years of local performing arts history dating from 1901 to 2001. Significant information was found at the public and university libraries and because of the local focus of the photo exhibit community members with first hand knowledge of the people and events were also consulted.

The information gathered through the research process was used to create description placards for each photograph, a three fold exhibit brochure, and the script for the audio tour. The tour script consisted of one or two paragraphs per photograph that would translate into 30-60 second recordings when narrated.

Research also discovered important primary documents within the library's extensive oral history collection. A review of the transcripts uncovered several interviews directly relating to the people and events illustrated in the photo exhibit. In addition, several individuals depicted in the photos were still living in the area and they were contacted and interviewed regarding their memories of the pictured events. These interviews were recorded and the digital sound files along with the existing historical recordings became an integral part of the final product.

2. Preparing the Audio

Because sound was the crux of the project special care was taken to collect and capture the best possible audio in terms of both sound quality and content. Three types of audio were designed into the tour and delivered via the VXML document and voice server. First, the prepared script for each photograph described above was read and recorded as individual sound files. To create sound of the highest quality a professional actor served as the narrator for the texts and the recordings were made in a professional studio. In addition to the narration for each photo the script also included introductory remarks and brief instructions on how to control and navigate through the automated tour.

The second type of sound files used in the tour were excerpts extracted from oral interview recordings. Short, 30-60 second clips, directly related to individual photos in the exhibit were cut from the longer interviews and saved as individual sound files. The new interviews, conducted specifically for this project, were recorded in the studio to insure high sound quality.

The older recordings, some dating back to as early as the 1940's, were also edited to provide short clips relating to the exhibit. It was found that the age and recording medium of these older interviews often made the sound quality unacceptable. In these instances, digital sound editing software was used to "clean" and improve the selected cuts for use in the tour. It is the inclusion of these first person narratives in the phone tour that gave the project its name, History Calls.

The third audio type used in the tour was not pre-recorded; rather the VXML document and voice server produced the sound as a computer synthesized voice. The text for these computer generated comments were written into the VXML code and then translated into audio by the voice server.

3. Creating the VXML Document

The VXML document controlling the tour was created and stored on a local Web server along with the audio tour sound files. Before beginning to write the VXML code it proved very helpful and instructive to diagram the options and paths that would be available to the user. This flow chart of the tour incorporated not only the introductory text and the information on each photograph but also included the pathways and use for several support sound files including: error/repeat warnings, redundant help messages, a looping sound file to indicate a "waiting" mode, and the introduction and instruction for the online user survey.

The help and instructional messages were included as text messages within the VXML document and were rendered by the voice server in computer synthesized speech. This convention helped distinguish aurally between the mechanics of the tour and the narrated exhibit. The synthesized voice immediately indicated to the listener that s/he had exited the tour narration and was now interacting with the navigational/help module.

Individually numbered sound files, reflecting the numbered photos in the exhibit, and the accompanying navigational text messages served as the foundation for constructing the flow chart. Once the main trunk was complete the ancillary branches were added. These branches included connections to: help information, error warnings, prompt messages, and the online survey.

Like a movie director's story board the flow chart served as a step-by-step outline of the entire program. The programmer's job was to create the paths and links in VXML indicated by the flow chart. Like most projects not every eventuality was covered in the initial flow chart and the designer and programmer worked together to iron out details as the project came together. Because VXML is designed for voice applications the tags facilitate the creation of voice menu systems and their inherent support structure. This project utilized many of the useful elements VXML makes possible, for example:

The system signaled the user that s/he was connected by playing exhibit appropriate music. Main Menu choices or the Help selection could be made over the music at any time.

Menu and other navigational decisions could be input either through voice or DTMF (phone touch pad).

If the user did not input within a predetermined waiting period the program would prompt him/her. After three different prompts, each more pointed than the last, the program returned the user to the Main Menu.

Voice inputs that were unrecognizable prompted another set of nested help messages each asking the user to repeat their choice concluding with the suggestion that the user now try the phone's touch pad.

4. Linking to the Voice Server

The voice server for this project was provided by BeVocal, a leader in VXML hosting service in the United States. BeVocal, like other commercial VXML providers, offers various plans according to the size and complexity of the project. In comparison to commercial applications History Calls was a rather small operation and only required a minimal hosting package. BeVocal provided 24/7 access to a voice server via a single toll-free number with a limit of 5 simultaneous callers. They also provided limited tech support as well as several online tools for testing and debugging the History Calls VXML document.

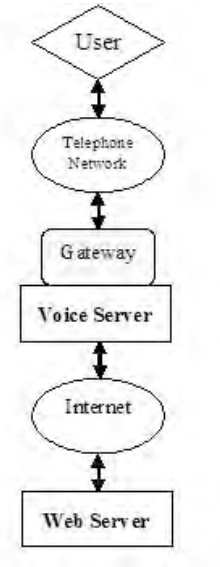

Figure 2: Server/gateway configuration

Once the final VXML document was finished and stored on the local Web server the BeVocal account was created and linked to the local document. Once this link was established the

BeVocal gateway was immediately available to accept incoming calls from patrons at the photograph exhibit. A standard transaction incorporated the following steps: A patron call to the toll-free number was accepted by the gateway, translated, and forwarded to the voice server. The voice server interpreted the voice/DTMF input from the gateway and forwarded this information to the VXML document on the local Web server. The VXML code determined the appropriate response which was sent back through the voice server and translated by the gateway to be received by the patron. Initial tests of the system revealed a few minor glitches that were easily corrected. Changes to the VXML document were effective immediately as were corrections and updates to audio files.

Evaluation

Both a print and an online survey were made available to all patrons at the conclusion of their visit. Like the tour, the online survey was an automated audio experience administered through the user's cell phone. The audio tour dialog contained several prompts inviting patrons to respond to the audio survey as part of their tour experience. These prompts appeared at the beginning, during, and at the conclusion of the audio tour. Evaluation questions were delivered aurally and patron responses received either through voice or DTMF input. The survey responses were automatically entered into a database for evaluation. A unique feature of the online survey was an opportunity for the patron to offer an oral comment on the exhibit. This voice message was recorded and saved to the data base as a digital sound file.

A print survey was also made available to all visitors to the exhibit. An advantage of the print form was that it reached patrons whether or not they took advantage of the automated phone tour. In this way general data concerning patron reaction to the exhibit was received as well as important data relating to why/why not they chose to try the automated audio tour.

Evaluation of the History Calls project revealed several strengths and weaknesses. As predicted, the upkeep of the tour was simple and very low maintenance. Changes could be made to the server quickly and efficiently and these changes were immediately implemented on the user side.

The first person narratives within the audio tour were a big hit with patrons and received a great deal of positive feedback on the exhibit surveys. Though not often found in audio tours, programs that use a variety of voices and perspectives can add interest and warmth to the audio experience (Schwartzer, 2001). Admittedly, this type of audio could be used in any audio tour system not just those delivered through cell phones but hearing the first person narration through their own telephones added to the reality and immediacy of the patrons' experience in a way that would not be possible using the digital players currently in use.

Both Voice and DTMF input were tested by patrons. In the "quiet" environment of the exhibit space most patrons were reluctant to use the voice input option and relied primarily on their phone key pad. Of those patrons who used the phone tour and responded to the survey, one half relied solely on DTMF to interact with the system and never used the voice interface. Though shunned by these patrons in the library gallery it is suspected that voice interaction would prove more popular in outdoor venues (zoos, historic sites). Voice interaction is also a powerful accessibility tool and an important benefit to handicapped patrons with limited mobility.

Though not encountered in this test some structures are not conducive to cell phone reception. This difficulty of using cell phones inside some buildings is another factor in favoring outdoor venues for cell phone tours.

A valid concern understood from the outset of the project was the additional cost some patrons might incur by using their cell phone as the audio tour playback device. Only one respondent to the survey indicated that concern about cost prevented him/her from using the phone tour. Three other respondents indicated that this concern limited their use of the tour. Patrons seemed to have widely different service plans and overall concern over cost and roaming was limited. At present, the expanding market and strong competition among cell phone providers is leading toward lower costs and increasing minutes. It is not unreasonable to expect that concerns over the cost for these types of phone services will diminish in the future as service plans become even more generous.

Evaluation of the VXML technology and phone tours specifically was very positive. All of the respondents to the automated survey indicated that the tour had improved their experience at the gallery and that they would take advantage of similar cell phone tours if offered at other cultural heritage institutions.

Possibilities for the Future

This successful test of VXML technology to provide automated audio information in support of a culture heritage site opens a broad range of possibilities that go well beyond the simple gallery tour described here. Since its development several other technologies have become available for disseminating this type of audio information via cell phones and the purchase and use of cell phones continues to expand.

The utility of this ubiquitous device is becoming more and more apparent to a variety of service providers and there will be a growing number of systems and applications becoming available to museums and other cultural heritage sites in the near future. Some of these systems should prove simpler and more cost effective then present systems and museums will be able to pick and choose from a variety of technologies and protocols to find a system that fits their particular size, mission, and budget.

Conclusion

Cell phones, PDAs, and other wireless hand held devices, as well as new hybrids combining these technologies, are radically changing how many people communicate, interact, and participate in the world around them. his rapid development and innovation in wireless technologies portend a rising need and opportunity to take advantage of these advances to explore new ways of distributing educational and cultural information. One area of focus, explored here, is adapting these technologies to deliver high quality, accurate, and engaging information directly to visitors' cell phones at museums, galleries, zoos, aquaria, botanical gardens, historic sites, and other cultural heritage venues. History Calls is one such project.

The "conversational" mode employed by patrons as they interact with a VXML system is an engaging and powerful tool for making cultural heritage come alive and for bringing history into the present. The voice input made possible by VXML allows patrons to not only view and learn about cultural artifacts but to talk to them as well. The simple change from digital player to cell

phone immediately alters the relationship between the patron, the audio information, and the artifact.

Letting the museum/site create and host the audio content while patrons supervise the care and upkeep of the players has many benefits. Beyond the specifics of the History Calls project this initial study suggests several general benefits from employing a VXML-based cell phone tour system including:

- Reducing the expense, time, and frustration associated with maintaining audio players and their support systems.
- Eliminating concerns over player damage, loss or theft.
- Reducing the anxiety some patrons feel when using rented or unfamiliar hardware.
- Simplifying daily updates and other changes in recorded information.
- Expanding the use of audio tours into large outdoor venues where renting machines might be problematic.
- Offering voice interactivity to patrons with disabilities.

Though this experiment was conducted in a museum/gallery setting the VXML system used in the project could easily be adapted to a host of other cultural heritage sites and applications. The primary goal of the project, to use patron hardware in delivering an automated audio tour, proved successful and invites more research and trials of the use of VXML and other cell phone-based systems.

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