AUTHORING TOOLS FOR MOBILE MULTIMEDIA CONTENT

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ABSTRACT
The latest generation of mobile phones comes with a rich set of capabilities for presenting multimedia information and it is expected that the mobile phone will soon be one of the most widespread devices for consuming multimedia content. In this paper, we present an overview of the key opportunities and challenges in developing tools for authoring multimedia content for the mobile environment. First, we discuss on a general level the different needs of professionals, hobbyists, and ordinary phone users for mobile multimedia authoring tools. We then focus on easy-to-use mobile phone based authoring tools aimed for ordinary phone users. We present some of the most important applications of user-created mobile multimedia content. We conclude by looking at the typical characteristics of the current and near future mobile phones from the perspective of multimedia content authoring and discussing two common authoring approaches used.

1. INTRODUCTION
Over the last decade, the popularity of mobile phones has exploded and phones have become an inseparable part of everyday life. While the original function of a mobile phone was to serve as a voice communication device, today’s phones provide a wide range of different functions including messaging, personal information management, and entertainment like games. The latest generation of phones comes with a rich set of capabilities for presenting and exchanging multimedia information, including pictures, video, animation, music, and multimedia combinations of these media types. As phones with multimedia capabilities become more common, the mobile phone is expected soon to be one of the most widespread devices for consuming multimedia content.

An interesting question is where all this mobile multimedia content will originate from. Large portion of mobile multimedia content will naturally be content, which has originally been created for some other distribution channel, and is just redistributed over mobile channels, for example content downloaded from the public Internet. Some content will be specifically created for the mobile environment, for example content offered by network operators and other mobile content providers. Finally, it is expected that a major share of the content will originate from the mobile environment itself and be created by the users of mobile phones.

In this paper, we present an overview of the key opportunities and challenges in developing tools for authoring mobile multimedia content. In particular, we concentrate on mobile phone based multimedia authoring tools. We understand the term multimedia authoring tool broadly, referring not only to tools, which are used for combining media objects to multimedia documents and presentations, but also to tools, which are used for creating individual media objects like pictures or sound clips.

2. AUTHORS OF MOBILE MULTIMEDIA CONTENT
From the authoring tool point of view, we can roughly divide the authors of mobile multimedia content into three major groups: professional content creators, hobbyists, and ordinary phone users. Each of these groups possesses different level of skills and resources for creating multimedia content. Therefore, the needs for authoring tools also differ between the three groups.

Professional content creators like graphic artists, multimedia designers, and professional musicians typically use powerful multimedia workstations, often equipped with special input and output devices, for creating multimedia content. They are highly skilled and appreciate the power and flexibility these tools offer. Taking into account the technical and user interface limitations of mobile phones, it is very difficult to match the power of the workstation based tools with mobile phone based tools. Therefore, we expect that the professionals will primarily use workstations and the existing tools they are familiar with when creating content for the mobile environment. Extensions and plug-ins to the existing tools are needed to better integrate them with the mobile environment, for example mobile phone emulators that allow previewing and testing the content on the workstation without the need to transfer it to the real device.

Hobbyists, for example amateur video and still photographers and hobby musicians, use fairly similar
tools and techniques for creating multimedia content as the professionals. However, since their skills and resources are typically more limited, they often prefer to work with simpler and cheaper versions of the tools used by the professionals.

While we expect professionals and hobbyists to prefer workstation based tools, mobile phone might still be a useful tool for them. For example, it could be used as an always-present tool for capturing raw material like photographs, which are then later transferred to a workstation for further processing, or as a “sketch pad” for immediate recording of new ideas.

Ordinary mobile phone users, by far the largest group, have typically no training and only limited experience on multimedia content creation. Authoring multimedia content easily becomes too difficult or time-consuming for them. To make authoring of multimedia content attractive, tools, which are very easy to learn and use, are needed. To allow fast content creation, it should be possible to create the content with the mobile phone alone, without need to transfer it to a workstation for additional processing.

Workstation based tools for creating mobile multimedia content are not very different from workstation based tools for creating content for other environments, which have been extensively studied in the literature. However, very little has been written about mobile phone based multimedia authoring. For the rest of this paper, we will therefore focus on easy-to-use mobile phone based multimedia authoring tools aimed primarily for ordinary phone users.

3. APPLICATIONS OF USER-CREATED CONTENT

Before delving into the details of multimedia authoring tools for ordinary phone users, we briefly discuss some examples of potential and already existing applications for user-created mobile multimedia content.

In many applications, the author creates multimedia content for his or her own personal use only. Phonebook, which stores contact information, is one of the oldest and most widely used of all mobile phone applications. In many phone models, it is already possible to attach multimedia data, for example a photograph of the person, to a phone book entry. Most phones allow extensive personalization of the user interface, for example with screensavers and ringing tones, and this application is well suited for user-created content. As the storage capacity of mobile phones increases, it becomes possible to store increasing amounts of data in the phone. Many of the latest phone models feature a multimedia album, which allows the user to keep important multimedia content, including self-created content, always with him or her. Another common mobile application is the calendar, which could be extended towards a diary with the possibility to include user-created multimedia content in calendar entries. Finally, creating multimedia content can be entertaining in itself, even without any particular need or use for the created content.

For sharing user-created multimedia content with a selected group of people, for example with relatives or friends, one of the most straightforward ways is messaging. Mobile multimedia messaging services have recently become available around the world. However, even simpler way of sharing is to present the content with the phone to the intended audience, for example to show an image on the phone display. This form of sharing is very secure to the author, since there is no risk that the shared content could be misused.

For publishing content for anybody to view, the most common way is distribution via World Wide Web (WWW). On the fixed Internet, weblogs, [1] frequently updated web sites that use a dated log format, are a popular form of publishing personal content. With the introduction of camera phones, weblogs aimed for mobile devices have emerged.

4. IMPLEMENTATION CONSIDERATIONS

While today’s mobile phones are quite powerful computing platforms, they still set many technical restrictions that affect the design of multimedia authoring tools. Further, there are some more fundamental restrictions related to the product concept itself, which are not likely to disappear with technology evolution. In this section, we look at the typical characteristics of the current and near future mobile phones from the perspective of multimedia content authoring.

4.1. User Interface

Current mobile phones come with color displays of around 100x100 pixels or more in resolution. While these displays are a major improvement over the low-resolution bicolor displays used in the earlier phone models, screen space is still very limited. This sets restrictions on the maximum amount of information that can be shown simultaneously as well as overall application complexity.

In most mobile phone user interfaces, the main input method is the keypad. In addition to the standard ITU-T numeric keypad, there is typically a number of quick access keys to the most common phone functions like starting and ending a call, bidirectional or four-directional navigation keys, and a number of softkeys, whose functions are context-dependent and typically indicated with textual or graphical labels on the display. These input devices have been designed for navigating user interface menus and entering numeric information like phone
numbers. Entering text is also possible, although it is relatively slow and cumbersome. [2]

Some of the high-end phones feature touch screens. Touch screens enable considerably more complicated applications with more diverse input forms, for example free drawing, to be implemented.

4.2. Other Multimedia Input Devices

Since the primary function of a mobile phone is voice communication, each mobile phone is equipped with a microphone. The built-in microphone is usually optimized for recording speech and therefore not well suited for recording general audio like music or atmospheric sounds. Some phones provide additional audio input connectors, which allow high quality audio to be recorded from any analog audio source. With speech recognition techniques, the microphone could also be used for entering text.

Camera is rapidly becoming a standard feature in new phone models or it is at least available as an accessory product. While the image quality of current mobile phone cameras cannot compete with "real" digital cameras, the quality is well adequate for phone and even computer displays and is rapidly improving. Besides simple capturing of still pictures and video, camera could also be used for example for scanning text or drawings.

Many new phones support technologies, either GPS or network-based, which allow tracking the geographical location of the phone. Further, some phones feature special input devices like accelerometers or thermometers for sensing the environmental conditions. Utilizing input from these sources, either separately or combined to form a more complete picture of the usage context, might offer interesting possibilities for multimedia authoring. [3]

4.3. Software Platforms

The first mobile phones had a fixed set of functions and applications. Current mobile phones support several different mechanisms for extending and customizing the phone’s functionality with new applications.

Most phones feature a mobile browser, which can be used to access applications residing on a server over the network. Browser-based applications are typically rather straightforward and fast to implement. Current browsers support an extensive set of image and animation formats, some browsers even support audio. The main drawback of browser-based applications is that the input possibilities are limited to making selections from pre-defined lists of choices and entering numbers and text. From multimedia authoring perspective, this might sound very restricting, but surprisingly many kinds of content can still be authored even with such restricted input methods.

Java has rapidly become a popular way to implement applications for mobile phones. Java’s advantages include high degree of device independence, which should allow the same application to be run on a wide range of different phones. Compared to browser-based applications, Java offers much better input possibilities. The first mobile Java standards unfortunately offered only very limited multimedia support, which has led to several vendor-specific extensions. The standardization of Mobile Media API [4] should improve the situation considerably. Another potential drawback of Java in computation-intensive authoring tools is its relatively low performance.

Finally, some high-end phones are built using an open operating system, which enables development of native third-party applications for the phone. Native applications allow the best possible performance, integration with the phone UI, and access to all phone features like special input devices. On the other hand, development times of native applications are commonly longer than in browser-based or Java applications. Native applications also usually run on a single or a few closely related phone models only and need to be ported to each new model separately.

4.4. Local and Distributed Tools

Mobile multimedia authoring tools can run as local applications in the phone or they can be distributed over the network. Java and native tools can be either local or distributed, while browser-based tools are obviously practically always distributed. There are several important differences between local and distributed tools.

Local tools must rely on the limited processing and storage resources available in the phone. This may severely restrict the set of authoring methods that can be implemented. Maintaining and upgrading of local tools is left to the responsibility of the phone user, which can make maintenance difficult. On the other hand, since the local tools require no network communication, there are no communication delays or costs to the user. The tools can be used even when the user is outside network coverage.

In a distributed multimedia authoring tool, the implementation is divided between the phone and servers in the mobile network. For example, content processing can happen completely on the server side with only the user interface residing in the phone. An important advantage of distributed tools is that they are easier to maintain and upgrade, since key parts of the application can be kept on centrally managed servers. Also, due to the more mature software platforms and more generous processing and especially storage resources on the server-side, it is typically possible to use more advanced authoring techniques than what is possible in local tools. On the other hand, distributed tools depend on network communication, which may cause communication delays and costs to the user.
5. AUTHORING APPROACHES

A wide variety of different approaches exist for authoring multimedia content. In this section, we take a closer look at two common approaches used in mobile phone based multimedia authoring.

In the first approach, the user primarily creates completely new content. This may include capturing content with the phone input devices, for example taking photographs or recording audio, as well as editing the content with the phone. Examples of tools based on this approach include general-purpose image, video, sound, and multimedia presentation editors. The basic design and features of mobile tools using this approach are not so different from similar tools for workstation environments. Due to user interface limitations, the feature set must be much smaller than in workstation based tools. The main challenges related to the design of this kind of tools are identifying the essential features, designing a mobile user interface for them, and implementing them well in a constrained software and hardware environment. This kind of tools often require fairly complicated user interfaces and access to special input devices, and are therefore best implemented as native or possibly Java applications. Due to the limited bandwidth of mobile networks, it is rarely feasible to distribute this kind of tools, since that would require transfer of raw material over the network. Content should be authored locally in the mobile phone and only the finished content should then be distributed over the network.

The second approach is based on creating new content by personalizing or combining pieces of ready-made content. For example, a multimedia message could be authored by selecting a ready-made message template and just customizing the message text. A more complicated example might include authoring an animation sequence by first selecting a ready-made animated character and then composing a script that the character will perform in the animation from a set of ready-made actions. User interfaces of this kind of tools are usually fairly straightforward and can be implemented even with browsers. One of the main challenges in authoring tools based on ready-made content is the management of the content. Users have different needs and like different styles of content. They also prefer the content to be unique, so each piece of content is typically used only once. Therefore, to keep the users interested in the tool, a very broad and continuously updated selection of content is needed. To implement this in practice, the most straightforward way is to keep all ready-made content in a single centrally administered place. Therefore, this kind of tools are often best implemented with server-based architectures. Browser, Java, or native client in the phone can then be used for accessing the content on the server.

6. SUMMARY

In this paper, we have presented an overview of the key opportunities and challenges in developing tools for authoring mobile multimedia content. We expect professional and hobbyist content creators to primarily use existing workstation based tools, which only need to be better integrated with the mobile environment. For ordinary phone users, easy and fast to use mobile phone based tools need to be developed.

There are many existing and potential mobile applications for user-created multimedia content. Some of the most interesting applications are phone personalization with self-created content, multimedia messaging for sharing multimedia content, and weblogs for publishing multimedia content.

Mobile phones set many restrictions regarding user interface, available multimedia input devices, and application implementation options, which affect the design and implementation of multimedia authoring tools. Some of the limitations are caused by the limitations of current technology, while some are more fundamental and related to the product concept itself.

A wide variety of potential authoring approaches exist. One common approach is to create completely new content with the phone, including capturing content with the phone input devices. This kind of tools are fairly similar to workstation based tools and best implemented as local native or Java applications in the phone. Another common authoring approach is to personalize or combine pieces of ready-made content. In this approach, the main challenge is the management of the ready-made content, which can often be best solved by keeping the content on centrally managed servers and distributing the tool between the servers and the phone. Overall, designing a mobile phone based authoring tool is always a question of finding the right balance between the ease and fastness of use and the expressive creativity that the tool enables.

7. REFERENCES


