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Design and Implementation of Self-networking and Replaceable Structure in Mobile Vector Graphics

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ABSTRACT

In this paper, self-networking and replaceable structure in vector graphics contents are presented for wireless internet service. The wireless networks over 2G or 3G are limited in the sense of the speed and the cost. Considering these characteristics of wireless network, self-networking method and replaceable structure in downloaded contents are introduced in order to save the amount of data and provide variations for contents. During the display of contents, a certain data for the contents is downloaded from the server and it is managed appropriately for the operation of the contents. The downloaded materials are reflected to the original contents using replaceable structure. Also, the downloading and modification are independent of the play. In this implementation, the data consists of control data for control and resource data for image, sound or text. Comparing to the conventional methods which download the whole data, the amount of the transmitted data is very small since only the difference is downloaded. Also, during the play of the contents, the changes are adopted immediately. The whole functions are implemented in wireless handset and the various applications are discussed.

Keywords: Vector graphics, Self-networking, Replaceable structure, Wireless handset

1. INTRODUCTION

According to the development of the network and communication technology, various data services including multimedia are being provided for users. Multimedia becomes a killer application of a data service. The development of wireless network and wireless handset makes it possible to implement many kinds of multimedia solutions in handset.

Recently, many multimedia contents have been commercialized such as image, video, 3D graphics, vector graphics and sound. Due to some restrictions of wireless network and handset such as memory limitation, low CPU processing power and narrow network bandwidth, it is very difficult to implement multimedia services. The efforts to reduce the contents size, effective networking without redundant data and fast player in handset are required for wireless internet service.

Considering these characteristics, vector image graphics is thought to be suitable for wireless network and handset. Contents size can be made smaller than raster graphics. In addition, it can be implemented regardless of the LCD size in handset. Also, by use of user interaction, several services can be provided. Nowadays, a few vector graphics technologies are developed for wireless internet such as VIS(Vector Image Service)[1,2], Flash[3-6] and SVG(Scalable Vector Graphics)[7,8]. Using these technologies, users can enjoy wallpaper service, game service, map service, and so on. VIS[1,2] is

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a wireless multimedia solution developed by NeoMtel, Korea. Comparing to Flash, VIS has smaller memory usage, faster decoding speed and smaller program size.

The materials in multimedia contents cannot be changed once they are made. Though there are user interactions, only the scenarios, image and sound which are already included in the contents, can be played. For the effective use of the contents and wireless network, self-networking functions and replaceable structure are required. Combining with the portability and mobility of wireless handset, various applications can be developed by use of self-networking functions. In fact, Flash also can import external SWF files. However, in Flash, the files which can be imported in it are only SWF files. Comparing to Flash, in VIS, various data can be downloaded from the server such as text string, image, sound, VIS and action script. The range of application is wide for wireless handset.

In this paper, self-networking and replaceable structure for downloaded contents are introduced for wireless internet. Self-networking schemes and replaceable structures in contents are proposed and implemented to wireless internet services. Also, the applications using the proposed methods in wireless handset are presented.

The remainder of this paper is organized as follows. In Section 2, the structure of VIS player is introduced. In Section 3, the self-networking and replaceable structure of VIS and its implementation are discussed. In Section 4, various applications using the proposed structures are presented and the conclusion follows in Section 5.

2. STRUCTURE OF VIS PLAYER

VIS(vector image solution) is a vector graphic solution for wireless handset developed by NeoMtel cooperation, Korea and is on service in Korean market. It is optimized for constraints in current mobile handsets such as processing power and memory usage by removing relatively impractical components of SVG and adopting additional useful parts for commercial service. Fig. 1 shows the service flow of VIS contents.

In VIS player, there are raster graphics engine, vector graphics engine, action script for interaction, sound/midi interfaces and self-networking functions. Since VIS supports action script, it is possible to play interactive contents, like Flash contents in PC environment, on mobile handset. Moreover, it can be integrated with the previous program of mobile handset without deteriorating stability of the program. Hence, it is possible to support interactive wallpaper service, which responses on key input directly in idle mode of mobile handset. The structure of VIS player is shown in

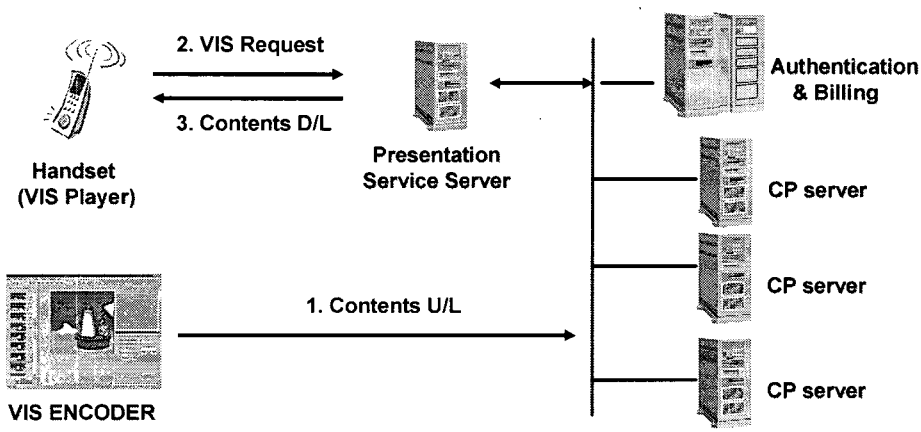


Fig. 1. Service flow of VIS contents.

Fig. 2. Brief functional descriptions of each module are as follows.

1) VIS Parser : is an API set for parsing command from VIS file contents. VIS uses command set based on bit-fields to reduce size of repetitive commands and vector type data.
2) Cache and Resource Manager : enables rich content to be played in poor resource environment. It keeps frequently used and high cost resource to reduce stream input/output cost and processing cost. This manages resource status dynamically by using memory allocation capability of system.
3) Interactivity Manager : supports various event based interactivity, such as action script, flow control, sound control, vibration control, hyperlink, graphical button operation, etc. It enables rich contents like simple games, graphical clock, graphical battery monitors.
4) Vector Engine : is a drawing library for vector graphics which is capable of handling bezier curves, bezier fill, morphing, lines, shapes, gradient color effects, alpha transparency, etc. It is optimized for fast drawing process.
5) Decoder (Lossy and Lossless) : decodes compressed data of raster graphic image in various compression technique such as Huffman, PNG, JPEG, etc. For present mobile handsets, raster graphic images can be more effectively used due to small size of LCD display.
6) Player Controller : shows VIS contents with player skin in player mode where VIS contents are played for preview before it is selected as wallpaper in idle mode.
7) Network Manager : relays data from mobile network to Cache and Resource Manager. It is integrated various adaptor functions that is using network operation and makes data from network as if there were from local flash memory.

VIS modules are ported in mobile handset on hardware interface layer by using adaptor functions and interface functions. Especially, the vector graphics engine part has the structures of Fig. 3.

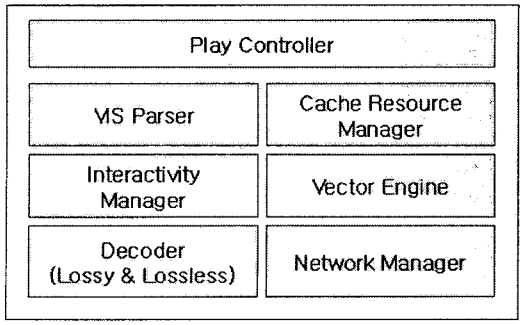


Fig. 2. Structure of VIS player.

The processing algorithms for vector graphics engine are as follows.

1) The memory of handset is limited. For the effective processing, predefined size of data is read fro, the input stream.
2) The read data is parsed. After parsing, the position of data is recorded.
3) The parsed data is saved in resource pool.
4) If there is a modification of actors command to display the resource data, the data is transferred to actors pool.
5) The data is rendered for the display buffer.

It takes much time in wireless handset to execute the vector graphics engine. It is possible to prevent other tasks while running the vector graphics engine. In order not to affect other tasks, after a certain amount of time, the possession of CPU is transferred to handset program.

3. SELF-NETWORKING AND REPLACEABLE STRUCTURE IN VIS

3.1 Self-networking and Replaceable Structure in VIS

The conventional multimedia contents cannot be changed or modified once they are made without downloading new contents. But the self-networking and replaceable structure functions can give various characteristics. The user can download only

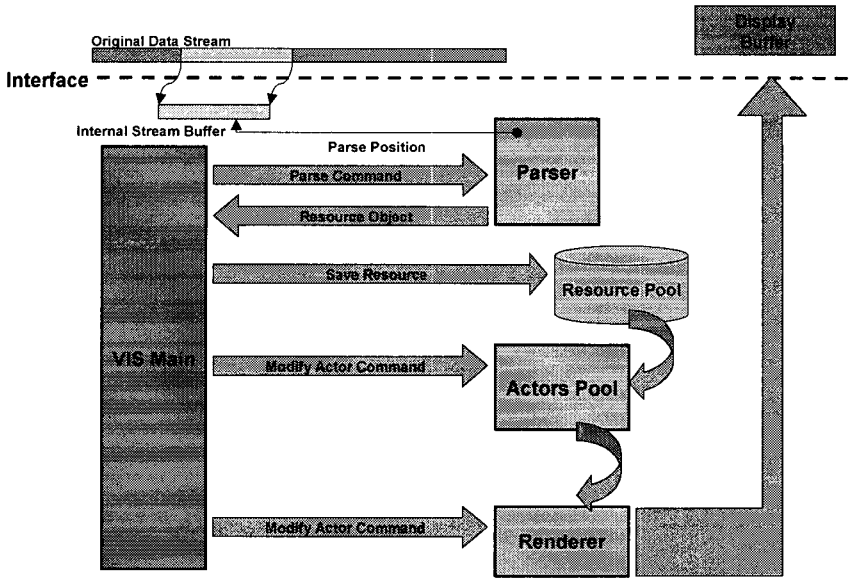


Fig. 3. Structure of vector graphics engine.

the changed part of the contents and can save the cost. Combining with the RTOS in handset, various data can be downloaded and many applications can be developed.

In self-networking, some data is transmitted using networking functions in contents from the server. The data is adopted to the play of the contents appropriately using replaceable structure. In the implementation of VIS, the structures which enable to communicate with external server and can modify the contents and scenario are designed and implemented.

For example, let us think the avatar service. In conventional methods, even if one wants to change only the part of face, new contents with different face should be made separately and it should be transmitted to the handset. Though the changed part in face is very small, the whole contents should be downloaded. Also, after transmission, prior content which is playing must be stopped and the transmitted contents must be played. Comparing to this case, when using the self-networking functions, only the changed part is transmitted. Also, the changes in contents are done in playing the contents. many applications can be made using these characteristics in wireless handset.

In fact, Flash also can import external SWF files using the script function **loadmovie()**. However, in Flash, the files which can be imported in it are only SWF files. Comparing to Flash, in VIS, various data can be downloaded from the server such as text string, image, sound, VIS and action script. The range of application is wide for wireless handset.

The data can be transmitted using PUSH, using downloading from the server or using SMS. The wireless handset has the characteristics of portability and mobility which make it possible to send the data anytime and anywhere.

3.2 Implementation of Replaceable Structure in VIS

In VIS, the replaceable structure is provided to change the components in the contents. The following components can be imported to VIS contents :

1) Text string
2) Image
3) Sound
4) VIS contents
5) Action script

Fig. 4 shows the concept of replaceable structure. As in Fig. 4, new components are imported in the contents and the previous components are deleted.

The characteristics of replaceable structure in VIS is as follows :

1) The same type components can be changed. That is, the sound components in VIS can be changed with sound components.
2) To change the component, the import functions do not use the filename directly but just use the component information.
3) Regarding the limited memory in wireless handset, the maximum data size which can be changed is fixed. Before uploading the contents or changing components to the server, they should be verified from the authoring tool.
4) The history of changing is not managed. After changing the previous data is removed.

3.3 Implementation of Self-Networking in VIS

It is good for wireless network services, if the following characteristics are satisfied for the self-networking :

1) Network functions should be provided in contents itself.
2) It is possible to connect to the server and download some data in contents.
3) Not only the play data such as image, sound and text, but also the control data for the play control of contents should be downloaded.
4) The downloaded data can be included in the contents and the contents can be changed using downloaded data.
5) Networking functions can be controlled by the user interactions in contents.
6) The designer of VIS contents can handle the network functions in contents.

Considering these characteristics, VIS self-networking functions are implemented. While VIS contents are played, some data are downloaded from the server and it affects the play of VIS contents.

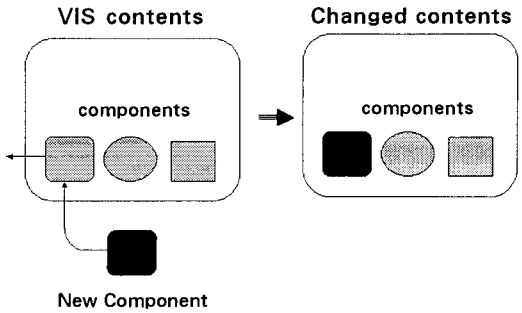


Fig. 4. Replaceable structure of VIS.

In this implementation, total data consist of the control data for the control and the resource data for image, sound, text string, VIS file and action scripts. The amount of transmitted data can be reduced. Also, the downloading and modification in contents are independent of the play and they can operate without stopping the play of contents.

In VIS, to request the data from server and download it, some script functions should be called such as **loadVariables(), importImage(), importSound()** and **importMovie()**. Once the script function runs, the VIS player connects to the server and requests data. In downloading data, the progress of VIS contents is holding and the player should notify the user of the downloading status. After the transmission of data, in the case of failure, the user has a display notifying failure. In case of success, the operation relating to the data are processed. Usually, the data request is done by VIS player. But in a special case such as **PUSH**, external data are downloaded without the request of VIS player. For example, in broadcasting, transmission of data from web site or data transmission using SMS, the request and download are done by **PUSH**. Also, in **PUSH**, the downloaded data is included in VIS files using some appropriate functions.

Fig. 5 shows the processes of data transmission of self-networking in VIS.

The downloaded data can be divided into two parts such as control data and resource data. These data are managed as follows :

1) Control data : Using control data, VIS player

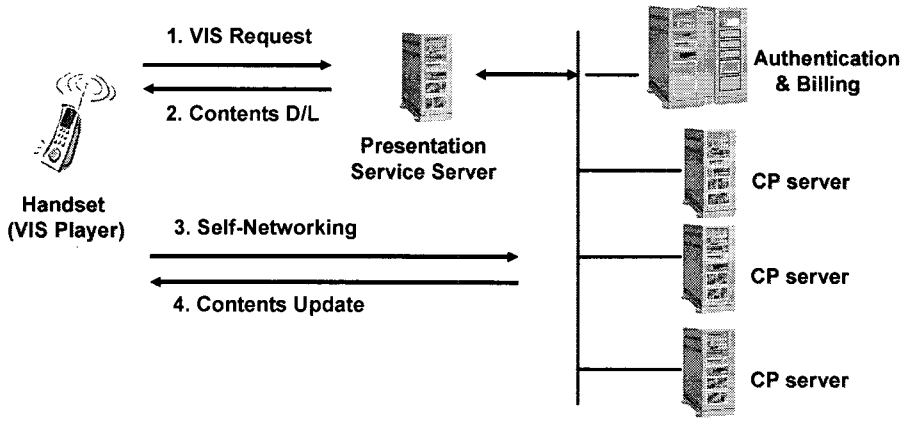


Fig. 5. The data transmission sequence of VIS networking.

can change the play of contents. Mainly, the control data changes the value of script variable. Scene variation in the display or value setting of the size and position can be done using these data.

2) Resource data : In case of resource data, it changes the resource in contents such ad text, sound, image or VIS file. For text, the news or SMS data can be displayed on the screen.

After the downloaded data is applied to the contents, the current state is recorded in the handset. In replaying the contents, the status information is considered and the changes by the network can be adopted.

4. WIRELESS INTERNET APPLICATIONS USING SELF-NETWORKING AND REPLACEABLE STRUCTURE IN VIS

Various applications can be developed with self-networking and replaceable structure in VIS combining with the handset and wireless network characteristics. The following applications are the examples.

4.1 Real-Time News

The news are displayed on the handset in real-time using image, text or sound. Combining with script, the news on economy, sports and others can be selected by the user. Especially, the news flash can be provided using **PUSH** from the server. Fig. 6 shows the baseball game broadcasting service using real time text transmission. After a pre-defined time, it connects to the server and reads the game data in real time and displays the changed information.

4.2 Mobile Avatar

The clothes, hair style and so on can be downloaded from the server and can be applied to the contents in the handset. Relating to the avatar in website, the variation of it can be adopted to the avatar in handset. Fig. 7 shows the transmission in avatar contents.

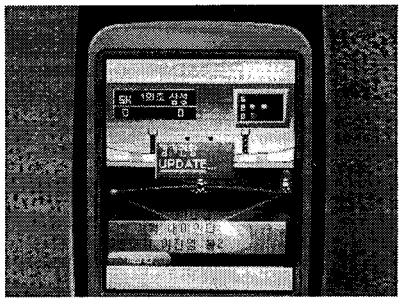
4.3 Survey

After making survey contents using VIS, the result from the user input are transferred to the server over wireless network. If one changes the problem of survey, it is possible to get a new result.

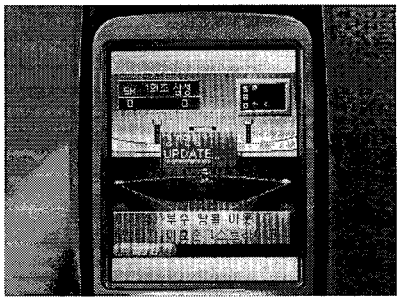
4.4 Application of photos

The user can make his own contents with transmitting his photos. The handset-camera can make the most of the VIS photo contents. Fig. 8 shows the examples of application of photos.

(a) Baseball broadcasting service



(b) Baseball game broadcasting using real-time data transmission



(c) Baseball game broadcasting using real-time data transmission

Fig. 6. Baseball game broadcasting.

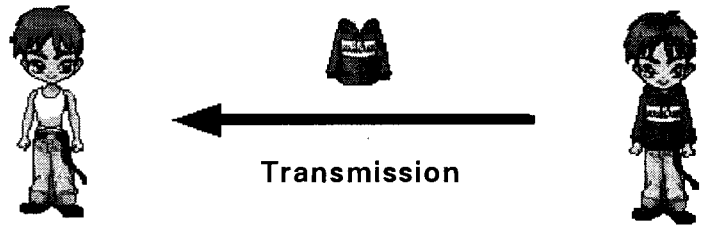


Fig. 7. Avatar images and data transmission.

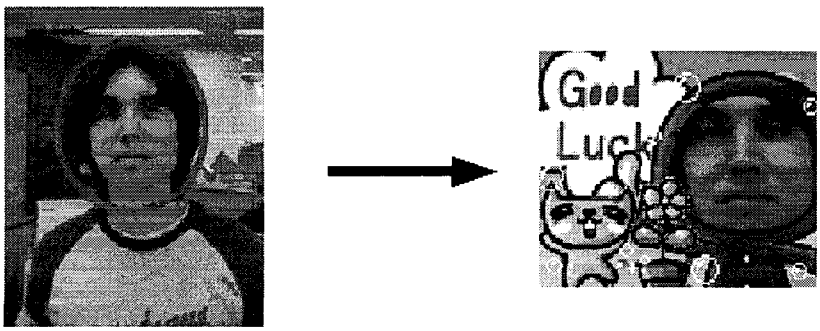


Fig. 8. Application of photos.

5. CONCLUSION

In this paper, self-networking and replaceable structure in contents have been described for wireless internet using handset. The conventional multimedia contents are fixed in the sense of scenario and the display. For the effective uses of the contents and wireless network, the self-networking functions are required. When playing the contents, it connects to the server and downloads some additional data for the changes of contents material or the control for the play. The basic concepts of implementation in VIS and the applications using these methods have been presented. These characteristics can make various applications in wireless handset combining with the portability and mobility.

In this implementation, the transmitted data includes image, sound, text string, VIS file and action script. Using the self-networking and replaceable structure, only the changed part is transmitted. Since the transmitted data is small, it is cost-effective and bandwidth-effective. Also, the changes in contents are adopted at once in playing the contents. As shown in the example services using VIS self-networking and replaceable structure, various applications can be developed effectively.

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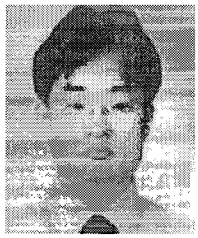

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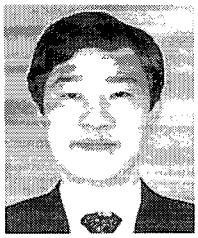

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