Image Transference & Retrieval over SMS

Muhammad Fahad Khan[1], Saira Beg[2] and Fakhra Kashif[3]

[1] Computer Science Department, Federal Urdu University of Arts, Science and Technology Islamabad, 46000, Pakistan

[2] Computer Science Department, COMSATS Institute of Information and Technology Islamabad, 46000, Pakistan

[3] Computer Science Department, Federal Urdu University of Arts, Science and Technology Islamabad, 46000, Pakistan

Abstract

Paper describes the method of sending colorful images and animations through SMS (Short Message Service) over GSM (Global System for Mobile Communications) network. Presented method has two main blocks; first block converts images or animations into characters. And second block applies Huffman coding compression method on those characters and set them as a payload text of SMS. Generally, SMS is text based service and cannot send multimedia contents.

For delivering multimedia contents, two other services are utilized which are; MMS (Multimedia Messaging Service) and EMS (Extended Messaging Service). EMS is an application level extension; can transfer predefined sounds, animations and images etc. But a drawback is that EMS is not supported as widely as SMS. On the other hand, MMS have richer contents than SMS and EMS. But for large files it needs higher network capability like 3G etc. Enabling colored images (raster/vector) and animation features in SMS we develop an application using J2ME platform.

Keywords: *GSM (Global System for Mobile Communications) network, SMS (Short Message Service), Raster and Vector Images, Animations, Huffman Coding compression.*

1. Introduction

GSM network provides different services which can be grouped in three major categories; Tele services (TS), Bearer services (BS) and Supplementary services (SS). Short messaging service belongs to the BS category [1]. Generally, GSM has three types of messaging services; SMS, EMS and MMS [1-3]. SMS is text based service and its size is limited to 140 bytes or 160 characters. And those characters should be alphanumeric or binary non-text only [3]. On the other hand, EMS is an application level extension of SMS. And it can transfer richer contents; predefined sounds, animations, images etc. But a drawback is that EMS is not supported as widely as SMS, and it's all content is present in message header which will be ignored in unsupported mobile phones [4].

For richer contents delivery, MMS service is used. MMS can transfer videos, sounds, pictures, animations etc. MMS size may be up to 1000 bytes, but for delivering such a large size files it needs higher network capability like 3G, Edge. Enabling MMS service may need enhancement in existing network infrastructure, new billing structure, content adaption and mobile capability (must support MMS service) etc [5].

In this paper we present a method which enables transferring of color images and animations through SMS. For this we develop an application which brings this feature in all GSM devices, even those which does not have EMS/MMS/GPRS/EDGE or other 3G, 4G capability. In this method, our main focus is to reduce hardware dependencies (as in case of MMS and EMS) and provide an alternative method of transferring one's emotion and pictures to the receipts. This Paper is divided into following sections. Section 2 described related work section 3 is about proposed methodology, section 4 discusses the results and lastly we conclude the paper.

2. Related Work

[6] discuss the method of transferring Stereo images through SMS over GSM network. In this method, authors convert the stereo images into characters and then set these characters as a payload text of SMS. They also compared the lightening effect on stereoscopic images. Image displaying with cordless phone is presented in [7]. It is a standalone image display device which has telephone and internet capability. [8] presents a method of sending and displaying animation through SMS over GSM network. Major information required for animated SMS are user identification number and animation flag. User identification number is used to identify the receiving party, flag value determined that SMS has animation or

not. If yes than specify content pointer location value which suggests animation location at receiver side and animation type.

[9] is about transferring voice through SMS. They test their method with three different formats; PCM, ULAW and AMR. And results suggested that their method could be improved by using compression method. [10] Discuss the method of transferring voice using SMS. In this, first get the utterance generated by the encoder card which present in a mobile phone, then converts it into non text representation and insert that text into the body of SMS. Reverse procedure is done on received data after receive the SMS at receiver end. [11] discussing the new J2ME RMI package, which makes use of object compression in order to minimize the transmission time. RMI EOP makes use of GZip and PPM for object compression.

3. Proposed Methodology

If user wants to send colored still and animated images, just browse the content through mobile application and press 'send' button. Our application hides the procedure which converts the selected content into SMS. Application has two main components; first component converts the selected content into characters and second component applies Huffman Coding compression and after that it set those characters as a payload text of SMS. First component has following steps;

1. first, it checks the type of selected content and then saves the content into signed ByteArrayOutputStream.
2. In second step, converts that ByteArrayOutputStream into unsigned integer array.
3. Now, convert unsigned integer array into their respective Extended ASCII character. But practically, some ASCII character values cannot send through SMS. Those ASCII character values are 0-31, so add 256 in those values which falling in the range to move them on to the range 256 to 287 and then converts each integer value into their respective Extended ASCII character.

Second component of application has following steps;

1. First, it takes input of first component and applies Huffman Coding compression method.
2. After compression, convert these compressed characters into strings.
3. Lastly, set these strings as payload text of SMS. There is huge possibility that those strings may consume multiple number of messages; so keep the order of SMS, we reserved first three characters which gives 0-999 indexing. Now add index number to all consumed SMS.

When SMS received at receiver side, our application buffer all incoming messages in order with the help of message index number. Now extract data from SMS and apply all above procedures in reverse order. After this an image or animation will displayed in a mobile screen. Fig 1 shows the sending procedure of an image/ animation.

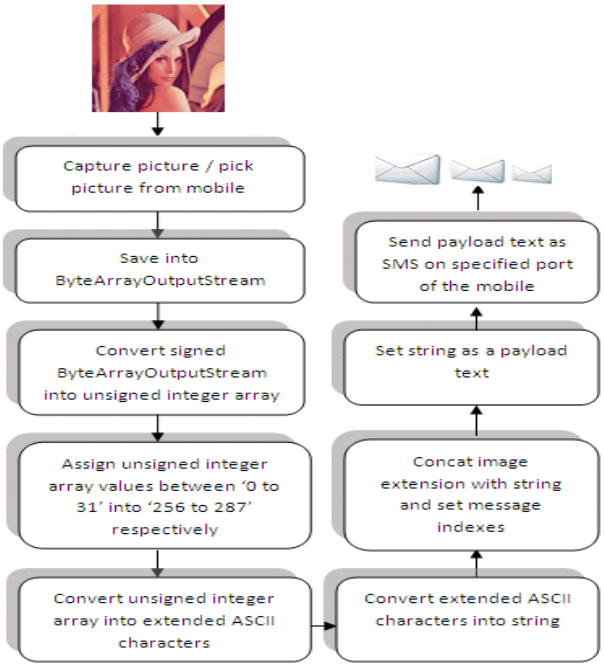

Fig. 1sending procedure of an image/ animation

4. Results, Discussion and Comparison

We developed an application using J2me platform and used Nokia 3110c mobile phones for testing. In this we consider 3 main factors, number of characters, number of connected messages (concatenated message) and unique colors. As SMS has limited data size, solution of this limitation is concatenated SMS [12]. Generally, there are two major image formats; Raster and Vector. For experiment, we used both image formats. Fig 2 shows the test structure which we conducted.

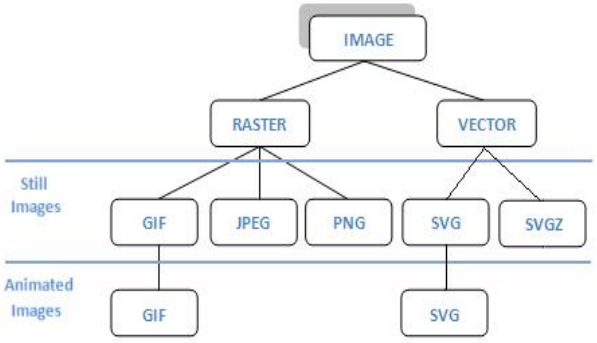

Fig. 2 Test hierarchies

Raster images are consists of pixels. Each pixel contains value which represents the brightness of image at any specific point. Two dimensional array of integer is used to store raster image, known as raster map. One drawback of raster image is that, they cannot scale up very well because it's directly effects the image quality. In contrast, vector images are consists of lines and curves which are points having direction and length. Vector images have small size than raster images because they does not keep track of small pixels as raster images do and they can easily scale up without compromising the quality [13]. In case of raster file format, we selected the three formats which are GIF, JPEG and PNG and for vector [15] we selected SVG and SVGZ formats.

4.1 Images Results

During experiment, for Raster format we keep track of four elements; image resolution, number of supported/unique colors, number of characters and number of connected messages. On other hand for vector images we focused on number of characters and number of connected messages. In case of raster, we select Lena image in JPEG, GIF and PNG formats respectively. Such images are taken from photo database [14].

We divided the experiments in two cases; with "WHCoding" and without "WOHCoding" compression. Fig 3 a, b and c represents the comparison of with and without compression. Fig 3 'a' discusses the comparison of raster images in terms of characters. According to results JPEG format generates small number of characters. On the other hand PNG has highest number of characters.

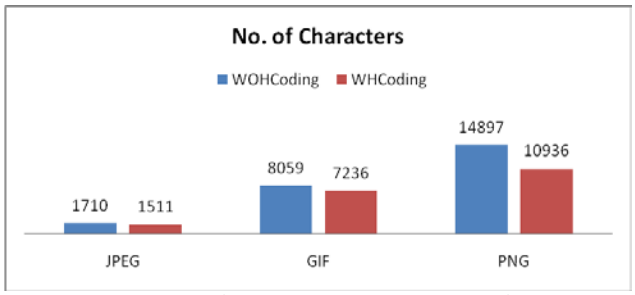

Fig 3a: Comparison of JPEG, GIF and PING in terms of Characters

Fig 3 b and c discusses the compression of raster images in terms of unique colors and connected messages. Connected messages and characters are directly proportional to each other.

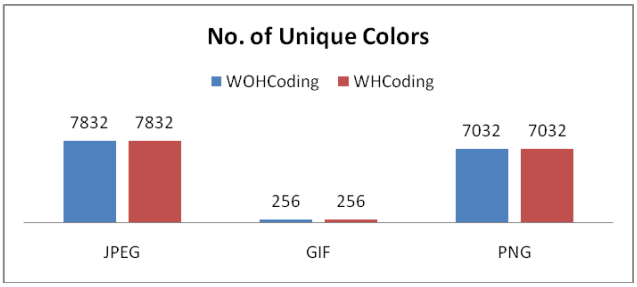

Fig 3b: Comparison of JPEG, GIF and PING in terms of Unique Colors

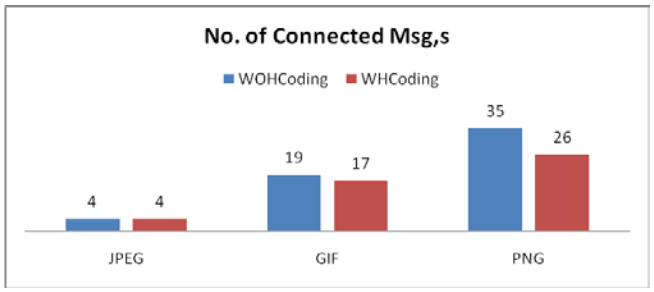

Fig 3c: Comparison of JPEG, GIF and PING in terms of Connected Messages

Fig 4 a and b shows the comparison of both vector formats in terms of connected messages and number of characters, while number of unique colors is same for both formats. Results suggested that SVGZ takes smaller number of messages than SVG; because SVGZ is compressed SVG with most general compression technique.

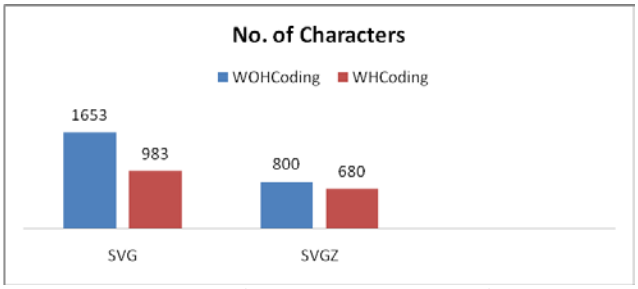

Fig 4a: Comparison of SVG and SVGZ in terms of characters

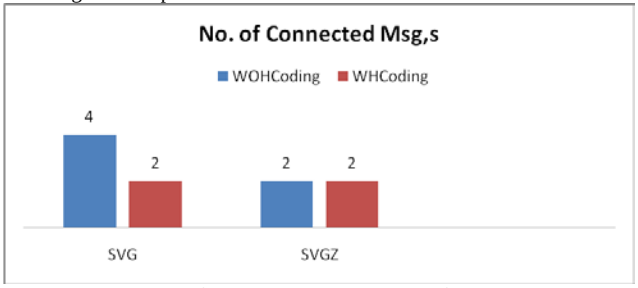

Fig 4b: Comparison of SVG and SVGZ in terms of connected messages

4.2 Animation Results

In second phase, we test our application with aniamtions. For this purpose, we select two aniamtions in SVG and GIF format. Table 1 shows the selected aniamtions. One important note: "GIF format is not supported by Microsoft Word, for this we convert such images in SWF format in order to show those images, similarly, SVG format for animation we convert it into SWF respectively".

Table 1: Selected animations

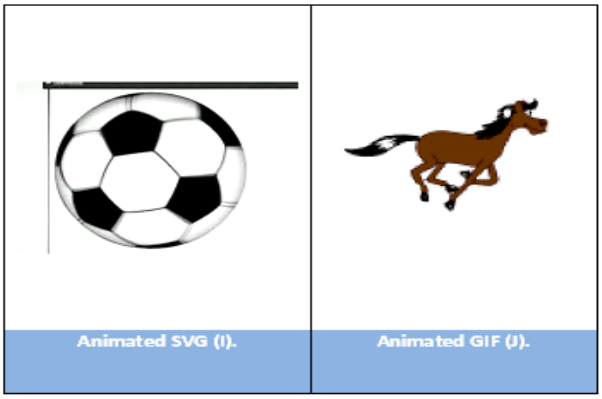

Table 2 shows the results of animations. SVG based animation generates smaller number of characters and messages, while GIF based animation produce larger characters and messages. In case of compression, SVG shows better performance than GIF. Only 4 connected messages

Table 2: Results of each animation without compression

Results of Animated Raster & Vector Without Compression			Results of Animated Raster & Vector With Compression	
Source Images	No. Of Characters	No. Of Messages	No. Of Characters	No. Of Messages
Animated SVG (I)	2927	7	1723	4
Animated GIF (J)	5165	12	4520	11

5. Conclusion

This paper presents a method which can transfer color images and animations through SMS. In this framework, our main focus is to reduce hardware and service dependencies, using existing GSM-SMS architecture. In other words, it is the only way of transferring images in absence of other services like, EMS, MMS, GPRS, and EDGE etc.

References

[1] http://e-articles.info/e/a/title/Features-and-Services-of-GSM/
[2] http://www.mobile-phones-uk.org.uk/mms.htm
[3] http://e-articles.info/e/a/title/The-Main-Protocols-used-by-Mobile-Phones-(SMS-EMS-MMS-WAP)/
[4] http://www.developershome.com/sms/smsIntro.asp
[5] Gordon A. Gow and Richard K. Smith, "Mobile and Wireless communication ", pp no:66, section 5.3.1, Published in 2006, Online available at: http://books.google.com.pk/books?id=RptTSXPgRekC&pg=PA66&dq=challenges+of+Multimedia+MEssaging+Service&hl=en&ei=6Jr1Tc2LI4HtrQfk0_XzDA&sa=X&oi=book_result&ct=result&resnum=6&ved=0CEkQ6AEwBQ#v=onepage&q=challenges%20of%20Multimedia%20MEssaging%20Service&f=false
[6] M. Fahad Khan and Saira Beg, "Stereo image Transference & Retrieval over SMS", Journal of Computing (JoC), pp 20-22, Volume 3, Issue 7, July 2011. ISSN-2151-9617
[7] LI et al. "image display with cordless phone", United States Patent Application, Publication Number US 2009/0128502 AI, May 21, 2009.
[8] Camp Jr, William O "Device and method for providing and displaying animated SMS messages", United States Patent Application, Publication Number 7756536 B2, Primary Class 455/456, (Chapel Hill, NC, US), 2010. Online Available: http://www.freepatentsonline.com/pdfb/documents/uspt/patent_pdf/7756/US7756536/pdf/US7756536.pdf
[9] M. Fahad Khan and Saira Beg, "Transferring Voice using SMS over GSM Network", Journal of Computing (JoC), pp 50-53, Volume 3, Issue 4, April 2011. ISSN-2151-9617
[10] Daniel L. ROTH "Voice over Short Message Service", United States Patent Application, Publication Number US2009/0017849 AI, and Origin: BOSTON, MA US, IPC8 Class: AH04Q720FI, USPC Class: 455/466, 2009. Online Available: http://www.freepatentsonline.com/20090017849.pdf

[11] Jalal Kawash, Ahmad El-Halabi and Ghassan Samara, "Utilizing Object Compression for Better J2ME Remote Method Invocation in 2.5G Networks", Journal of Computing and Information Technology pp 255–264, - CIT 14, 2006, 3.
[12] Sun Microsystems, Inc"Wireless Messaging API (WMA) for Java™ 2 Micro Edition Reference Implementation", Version 1.0, JSR 120 Expert Groups, 2002.
[13] http://www.signindustry.com/computers/articles/2004-11-30-DASvector_v_raster.php3
[14] http://www.petitcolas.net/fabien/watermarking/image_database/
[15] http://www.svgopen.org/2010/papers/3-Compressing_SVG_with_EXI/index.html

MR. Muhammad Fahad Khan is working as a Lecturer and In charge of Management Information System in Federal Urdu University of Arts, Science and Technology, Islamabad. He is interested in Mobile Application and Information System Development, Information Security and Embedded Systems. He did his Bachelor Degree from Federal Urdu University of Arts, Science and Technology in 2008 and now pursuing his Master Degree from IQRA University, Islamabad Campus.

MS. Saira Beg is working as a Research Associate (May 2009- up to date) in COMSATS Institute of Information Technology, Islamabad. Her Interest areas are Networks, Network Security and Artificial Intelligence and other their related Fields. She is the member of Artificial Intelligence Group at CIIT, Islamabad. She did her Bachelor Degree (Gold medalist) from Federal Urdu University of Arts, Science and Technology, Islamabad, Pakistan in 2008 and now doing her Master Degree from COMSATS Institute of Information Technology, Islamabad.
.

MS. Fakhra Kashif is working as Assistant Professor in Federal Urdu University of Arts, Science and Technology, Islamabad. Her Interest areas are Data Mining and RDBMS. She did her Bachelor Degree and MS Degree from International Islamic University Islamabad, Pakistan.