Image Transference & Retrieval over SMS

Muhammad Fahad Khan[1], Saira Beg[2]

[1]*Federal Urdu University of Arts, Science and Technology, Islamabad, Pakistan*

[2]*COMSATS Institute of Information and Technology, Islamabad, Pakistan*

mfahad.bs@gmail.com , sairabegbs@gmail.com

Abstract

The paper presents an alternative way of transmitting colored images in Short Message Service without Dependencies of EMS/MMS/EDGE/HSDPA and other high data rate 3 or 4G IP Technologies. Usually Short Message Service (SMS) contents are text based and limited to 140 bytes. In contrast, Extended Messaging Service (EMS) is an application level extension; have richer contents then SMS For Example. Predefined sounds, animation and images etc but having one major drawback that it is not widely supported than SMS. 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*

1. Introduction

In 2G networks, GSM (Global System for Mobile Communications) have major contribution than other digital technologies [1]. GSM provides different services; such as voice call, SMS, emergency services etc [2]. SMS, EMS and MMS (Multimedia Messaging Service) are used for delivering short messages in GSM. SMS is limited to 140 bytes or 160 characters. And characters should be alphanumeric or binary non-text. In contrast, MMS contains richer contents than SMS e.g. images, video, text, voice etc. And have larger size limit may be of 1000 bytes. But need 3G network capability for sending large size messages [2-3]. Where, EMS is in between of SMS and MMS. It could transfer sound, images and animations etc. [4]. EMS has very less supported than SMS, and it's all components are present in the message header which will ignored in unsupported mobile phones [5].

In this paper we present a method of transferring still, animated raster and vector images using SMS. We developed an application which enables such features for all GSM devices (support SMS), even those which does not have EMS/MMS/GPRS/EDGE or other 3,4G capability. In this method, our main focus is to reduce hardware dependencies and provide an alternative method of transferring one's emotion and pictures to the receipts. This Paper is divided into following sections. Section 2, 3 described related work and proposed methodology respectively, section 4 is about results discussion and comparison; at the last we conclude the paper.

2. Related Work

Li et al [6] is about image displaying with cordless phone. An image display which can be capable of used with cordless phone such image display is a standalone image display device and have telephone and internet (wired or wireless connection). And other research discusses the handwriting transmission through SMS over GSM network. Y. Hazem Abdelazim et al [7] In this Patent Paper they perform four major steps; firstly record the handwriting strokes, second normalize them in order to get homogeneous pattern points for handwriting. Third compresses those patterns into streaming and fourth encode these data streams and transmit those using SMS over GSM network. Moreover Camp Jr, William et al [8] discusses the method of sending and displaying animation through SMS over GSM network. [9] Represents the method of sharing data through SMS. In this method data is shared between mobile terminals and server in such way that, mobile terminal generates SMS according to their requests and send those SMS to the server. After receiving such SMS at server side, it generates responses according to the requests and sends them via MMS to respective mobile terminal (which initiate the request). Daniel L. Roth [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.

2.1. Existing Messaging Service

Short Message Service (SMS) is a text message service which enables two-way messaging between single or group of peoples. Such message is limited to 140 or 160 alphanumeric characters. Firstly it was initiated for GSM but later adapted by other systems such as; TDMA (Time Division Multiple Access) and CDMA (Code Division Multiple Access) etc. Due to standardization and popularity almost all phones are capable of sending/receiving SMS [11]. The major drawbacks of SMS are; very limited data size and cannot include rich media contents (like sound, animation and pictures etc) [5].

Limited size problem was solved by an extension, called concatenated SMS. In this method up to three SMS can be concatenated [12-13]. For richer media contents, an application level extension called EMS was developed [5]. This enables pictures, melodies, sound marks, graphic, animations, fonts, and formatted text etc. It can support both basic (black and white) and extended pictures (black, white, grayscale or colored); ranges from 16x16 pixels, 32x32 pixels in basic etc. Similarly it can support sounds (melodies in iMelody standard, user defined and some type of predefined sounds etc) which can take up to 128 bytes [11]. Applications of EMS are user to user message, voice and email notification, unified messaging etc [13]. EMS is very less supported than SMS, and it's all components are present in message header which will ignored in unsupported mobile phones [11, 5].

MMS can deliver richer contents such as; video, sounds, pictures, animation etc. It has lager data size up to 1000 bytes, delivering such a large size its need higher technology support such as 3G etc. some problem related to MMS are device compatibility, interoperability(not guaranteed), required upgraded messaging infrastructure, new billing structure, content adaption etc [14-15].

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. Such conversions have following steps;

- first it checks the type of selected content and then saves the content into signed ByteArrayOutputStream ,
- In second step ByteArrayOutputStream will convert into unsigned integer array,
- Next. Integer array will be converted into their respective ASCII characters. Before that conversion, add 256 in those values which falling in the range to move them on to the range 256 to 287. ASCII character values 0-31 cannot be send through SMS. These characters are reserved for some specific function for example null. After that procedure converts each integer value into their respective Extended ASCII character,
- lastly convert these characters into strings and set these strings as payload text of SMS.

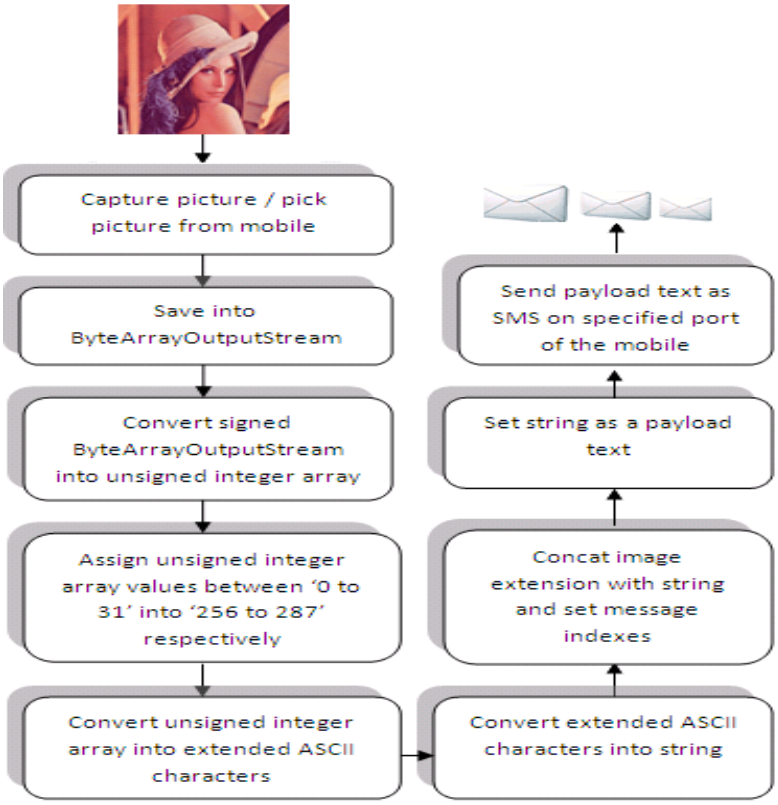

Fig 1: Sending Algorithm

Figure 1 shows the sending procedure of our application. We consider "A and B" mobile phones as a sending and receiving entity respectively. We browse our mobile memory for the image, and select "Lena" image in JPEG format for transferring. After selection we just press

the send button of mobile A. Our application converts the selected image into SMS. Total connected SMS produced by our application are 4 for the Lena Image. When such SMS receives at receiver side, our application, buffer all incoming messages and puts them in order. Basically, SMS have very limited size of 140 bytes. So we used concatenation SMS (an extended SMS). For ordering purpose we reserved reserve first three characters for indexing. This gives 000-999 connected SMS indexing. After placing received SMS in order at receiver end, we extract data from the SMS and reverse procedure is applied of above mentioned method. It converts back data into still and animated image. The reverse procedure will be as follows;

- Payload text is extracted from the SMS first,
- Strings of payload text will converted into Extended ASCII characters
- Converts ASCII characters into their respective integer value and subtract 256 from in order to get actual integer values.
- Lastly integer values will converts into ByteArrayOutputStream and where we get actual image

Figure 2 shows the working of our proposed methodology within existing GSM network. Our application will run in a mobile phone just like other applications. No change or up gradation will require in GSM architecture. We used only SMS service of GSM. Sending and receiving of SMS is the same as GSM architecture have. There will be no change in existing GSM-SMS architecture.

Fig. 2 Proposed System Interactions within the GSM Architecture

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. Figure 3 shows the test structure which we conducted.

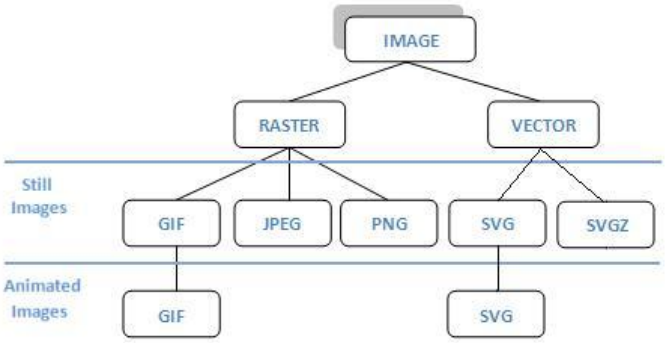

Fig. 3 Test Hierarchies

4.1. Raster and Vector Images

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 [16]. In case of raster file format, we selected the three formats which are GIF, JPEG and PNG and for vector we selected SVG format.

4.2. Images and Results

For experiments we used different images taken from photo database [17]. Examples related to experiment are; Baboon .JPEG, Peppers .GIF, Lena .PNG and many more. First we setup the experiment with the installation of application in two mobiles (Nokia 3110c). Then all selected images and animations were loaded in a sender mobile phone. For experiments we select different images and send them to the receiver, each image produce different number of characters. Image properties such as unique color etc. will effects the character numbers.

During experiment, for Raster format we keep track of four elements; image resolution, number of supported and 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 results, we select Lena image in JPEG, GIF and PNG formats respectively. Figure 4 a, b and c represents the comparison of three raster formats in terms of unique colors, number of characters and messages. According to results PNG format takes large number of messages than other two formats.

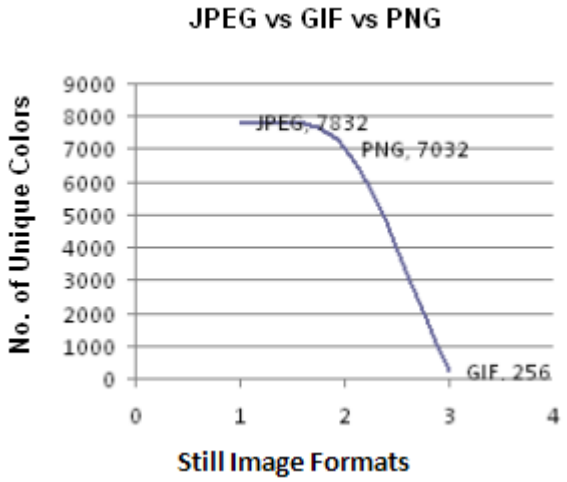

Fig 4a: Comparison of JPEG, GIF and PING in terms of Unique Colors

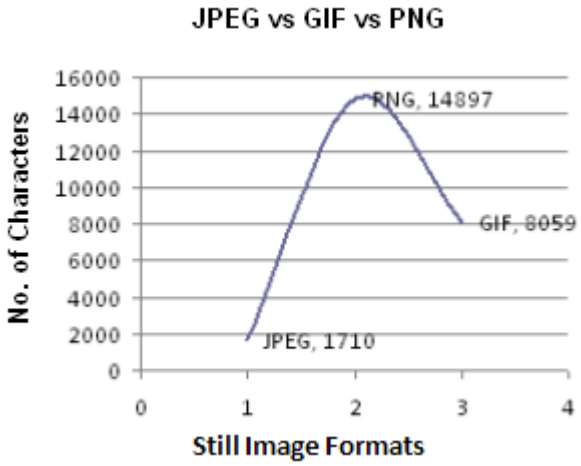

Fig 4b: Comparison of JPEG, GIF and PING in terms of Characters

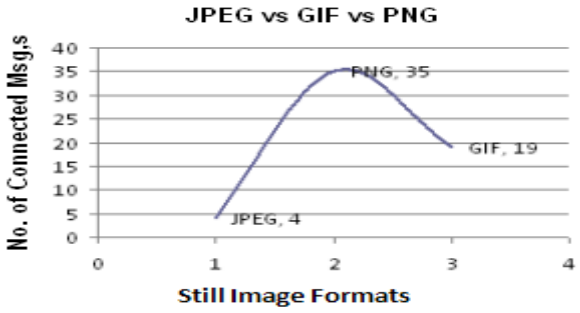

Fig 4c: Comparison of JPEG, GIF and PING in terms of Connected Messages

For vector, SVG and compressed SVGZ formats are selected [18] .Figure 5 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 [18].

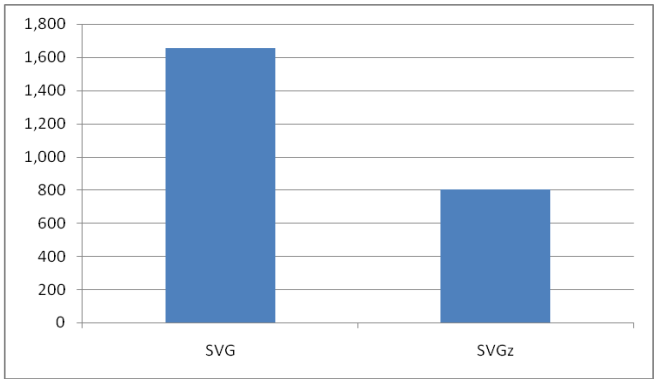

Fig 5a: Comparison of SVG and SVGZ in terms of number of characters

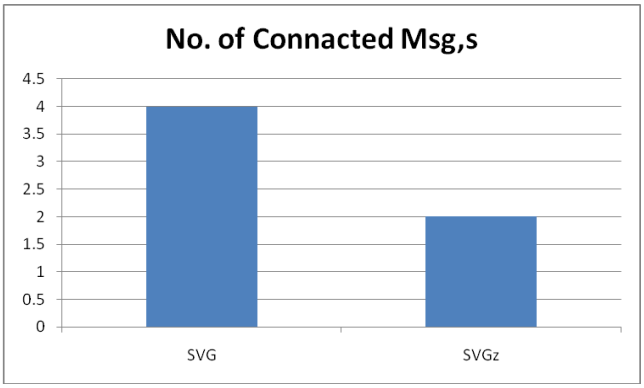

Fig 5b: Comparison of SVG and SVGZ in terms of connected messages.

Next we test our application with animations. Table 1 shows the animations in SVG and GIF format. "One major 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 2 shows the result of each format. Here, we consider two elements such as; number of characters and number of messages. SVG take 7 connected messages and GIF needs 12 respectively.

TABLE 1: REPRESENTING ANIMATIONS

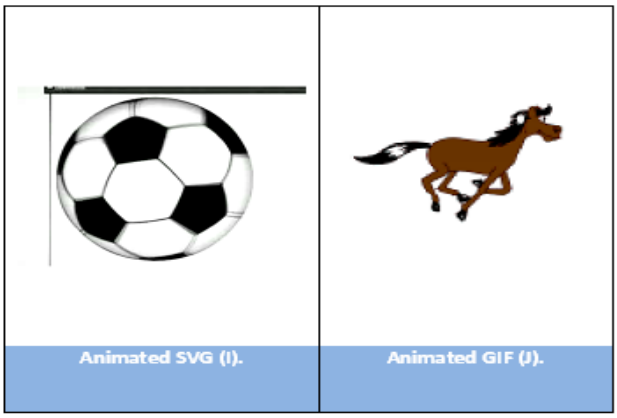

TABLE 2: RESULTS OF EACH ANIMATION TYPE

Results of Animated Raster & Vector Images		
Source Images	No. Of Characters	No. Of Messages
Animated SVG (I)	2927	7
Animated GIF (J)	5165	12

5. Advantages and Disadvantages

As discussed earlier that proposed system is about transferring colored images and animations using SMS over GSM network. As SMS is text based short message having 140 bytes only. For image transferring through short messages, GSM have EMS and MMS. EMS is an application level extension, due to this it is not widely supported than SMS and limited to the mobile phone type. Similarly, MMS need 3G or other network support for large size up to 1000 bytes. In this framework, our main focus is to reduce hardware and service dependencies, using existing GSM-SMS architecture. One main drawback of the proposed system is large number of connected messages but it is the only way of transferring images in absence of other services like, EMS,MMS,GPRS,EDGE etc This drawback can be removed using compression techniques.

6. Conclusion

This paper presents an alternative way or method of sending still and animated color images (raster and vector) using SMS over GSM Network. SMS is usually text-based and limited to 140 bytes where EMS which is application level extension, have ability to send predefined sound, animations and images etc but have major drawback that it is not widely supported than SMS. Similarly, MMS have much richer contents than EMS and SMS but need 3G capabilities and other high technologies, when it size is up to 1000 bytes. Our method is very simple and it major concern is to reduces the

hardware dependence using existing GSM architecture. And enable user to send their emotions through pictures even without have WAP/GPRS/EDGE/HSDPA or other 3,4G capability. And widely support of SMS, our application can be used across all operators and regions. One serious disadvantage with our method is that, it produces large number of connected messages; such problem can be reduced using compression techniques.

References

[1] Andersson, Christoffer "GPRS and 3G Wireless Applications", Wiley Computer Publishing, New York, p no: 15, 2001.

[2] http://e-articles.info/e/a/title/Features-and-Services-of-GSM/

[3] http://www.mobile-phones-uk.org.uk/mms.htm

[4] http://mobiletidings.com/2009/02/13/what-are-ems-messages/

[5] http://www.developershome.com/sms/smsIntro.asp

[6] LI et al. "image display with cordless phone", United States Patent Application, Publication Number US 2009/0128502 AI, May 21, 2009.

[7] Y. Hazem Abdelazim, Cairo (EG) "Transmission of handing writing over SMS protocol", United States Patent Application, Publication Number US 2008/0233986 AI, 25 September 2008.

[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] Sun-Yong Kim, "Method for Sharing Data using SMS", Patent Application, Origin: Uniondale, NY US, IPC8 Class: AH04Q720FI, 2006 Online Available: http://www.faqs.org/patents/app/20080248821

[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] http://e-articles.info/e/a/title/The-Main-Protocols-used-by-Mobile-Phones-(SMS-EMS-MMS-WAP)/

[12] Sun Microsystems, Inc"Wireless Messaging API (WMA) for Java™ 2 Micro Edition Reference Implementation", Version 1.0, JSR 120 Expert Groups, 2002.

[13] Ericsson Mobile Communications AB, Enhanced Messaging Service White Paper, Publication number: LZT 108 4854 R1C, 2010. Online Available: http://www.pixaware.com/papers/20010903_ems.pdf

[14] Daniel Ralph Paul Graham, "MMS Technologies, Usage, and Business Models", John Wiley AND Sons Ltd 2004, pp no 37, section 1.4.4, online available: http://books.google.com.pk/books?id=PWv8cIcwC7YC&pg=PA4&lpg=PA4&dq=challenges+with+MMS&source=bl&ots=HV11xaZwNb&sig=FlOxT6Y3VIRtG54CXp0Qr0F4x28&hl=en&ei=Rd7zTaC3DYXLrQfvrdjhBg&sa=X&oi=book_result&ct=result&resnum=7&ved=0CFEQ6AEwBg#v=onepage&q=challenges&f=false

[15] Gordon A. Gow and Richard K. Smith, "Mobile and Wireless communication ", pp no:66, section 5.3.1, Published in 2006, online available: 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

[16] http://www.signindustry.com/computers/articles/2004-11-30-DASvector_v_raster.php3

[17] http://www.petitcolas.net/fabien/watermarking/image_database/

[18] http://www.svgopen.org/2010/papers/3-Compressing_SVG_with_EXI/index.html