

Modulation and Demodulation of Image Processing by Using GMSK

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Abstract

Today digital communication is widely used in telecommunication sector in which the information is coded in the form of bits. There are many techniques that are implemented for modulation in digital communication some of them are BPSK, QPSK, M-ary PSK, GMSK. While transmitting an image there is always a challenge to retain the quality of an image by using these digital modulation techniques. In this paper GMSK technique is used for transmitting an image. The GMSK modulation technique is widely used in GSM techniques. By using GMSK modulation technique, which carries the information with high data rate and this is very important for image transmission. The proposed system gives better results than other modulation techniques like BPSK and M-ary PSK.

Keywords: GMSK, image processing, PSNR, MSE, Std.Dev.

1. Introduction

In this paper GMSK technique is used for transmitting an image. In GSM the GMSK modulation technique is used. GMSK modulation technique, which carries the information with high data rate and this is very important for image transmission. There are many modulation techniques in communication system and an image can be transmitted.

To achieve better values of Bit Error Rate, Signal to noise ratio & Bandwidth.

As an image can be easily converted into the digital data, it is possible to transmit an image using the this technique. Out of which the GMSK is the suitable technique for sending images in GSM technology [1].

2. Gaussian Minimum Shift Keying (Gmsk)

2.1. Generating GMSK Modulation

Gaussian Minimum Shift keying is the technique which used for GSM modulation. It is generated as shown in Fig 1. GMSK modulator uses LPF, VCO & RF amplifier.

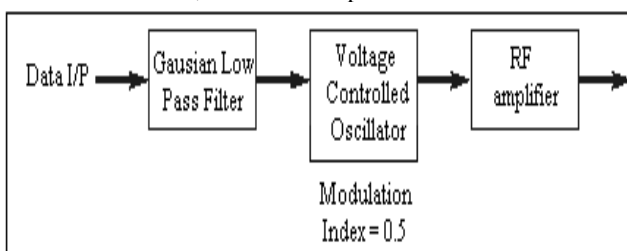


Figure 1: GMSK generator with gaussian filter and VCO

Another method to generate GMSK is as shown in Fig 2. For generating GMSK In phase & Quadrature Phase Components are separated and multiplies with Cos & Sin carrier respectively or vice-versa.

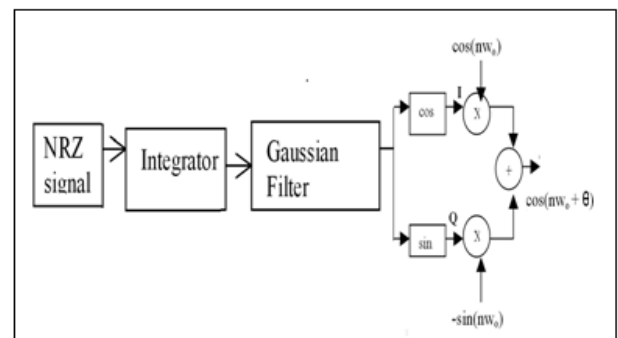


Figure 2: GMSK Generator using I-Q components

2.2. GMSK Bit Error Rate

Error probability can be calculated using following formula.

$$Pe = \left(\sqrt{\frac{2\alpha Eb}{No}} \right) \quad (1)$$

Where

$\alpha = BT$ constant, $\alpha = 0.68$ for GMSK and $BT = 0.3$.

A filter ideally has an output before input, it can be estimated using only a delayed and shaped impulse response which has a shape like Gaussian. This is known as GMSK modulation.

One of the binary digital modulations is GMSK, its BER performance over something in the high SNR. These schemes are depends on more than 2 levels (e.g. QAM, QPSK) which require better SNR than two-level schemes for similar BER performance. [4, 6, 7].

3. Implementation of GMSK for Image Processing

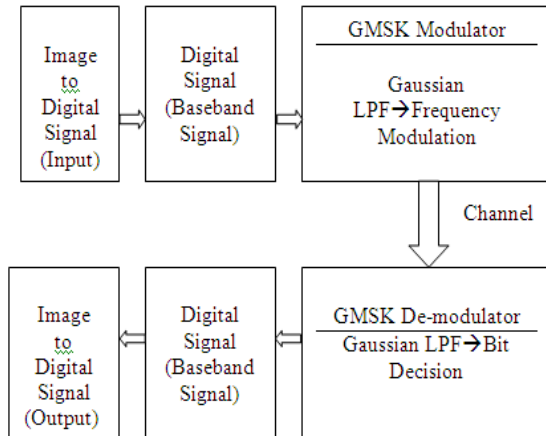


Figure 3: Development B.D of DIP by using GMSK

GSM adopted a BT of 0.3 with a channel data rate of 270.8 kbps; designers used a BT of 0.5 with channel data rate of 1.152 Mbps

3.1. GMSK in GSM

Global system for mobile communication (GSM) is a accepted globally for digital cellular communication and the most preferably GMSK modulation & demodulation is widely used in GSM.

Table 1: Important features of GSM

Parameters	Specs
Freq. Range	Receiver:925-960 MHz Transmitter: 880-915 MHz
MAT (Access Technique)	FDMA, TDMA
Method of Duplexing	FDD
Total channels	124 (8 users/channel)
Spacing (Channel)	200kHz
Technique of Modulation	GMSK (0.3 Gaussian Filter)
Bit Rate (Channel)	270.833Kb

3.2. Proposed Methodology of Digital Image Processing By Using GMSK

As flowchart indicating the proposed methodology, input to the system is an image which will be converted into digital data using MATLAB. This digital information we will going to use as input signal to GMSK modulator. [8] [9] [10]

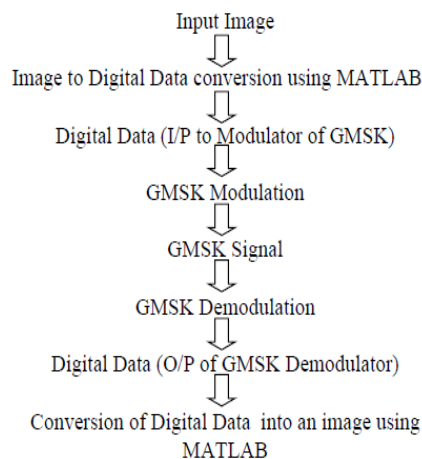


Figure 4: Methodology for Image processing using GMSK

4. Results and Discussions

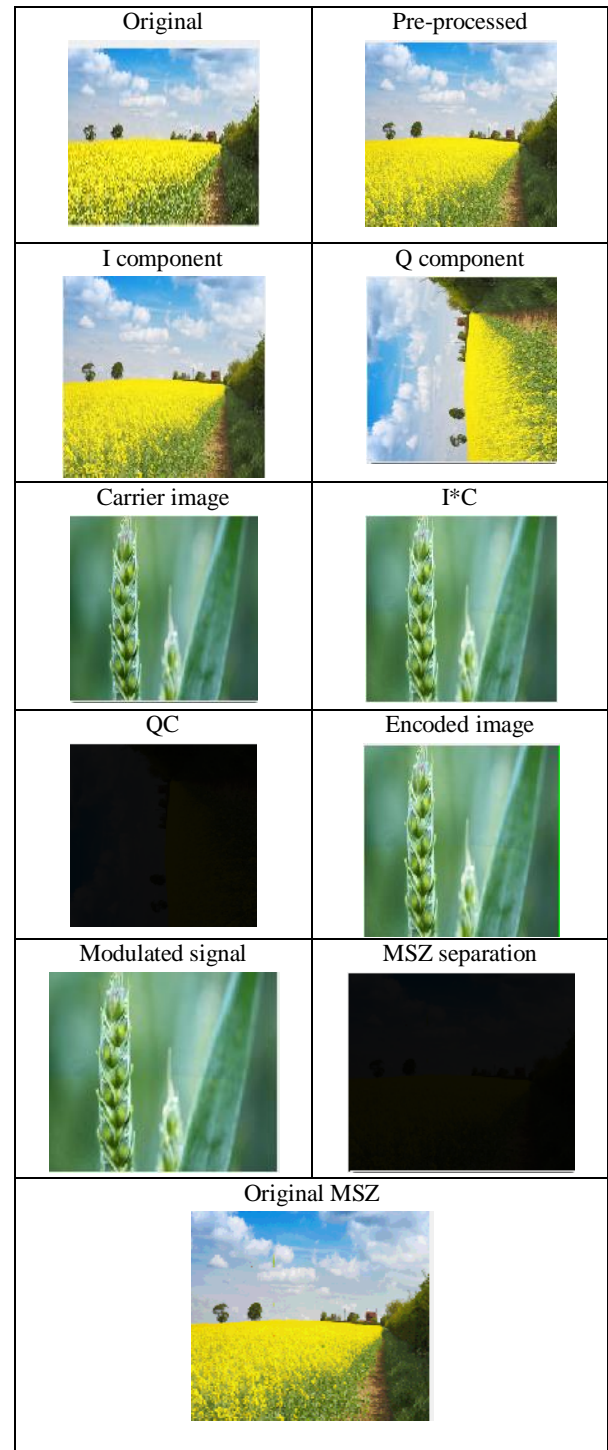


Figure 5: Simulation results

Table 2: Simulation Results of the Proposed Method

Color Images	PSNR	MSE	Std deviation	Variance
Image 1	50.3521	153.7325	44.5955	1989
Image 2	37.6648	43.2275	44.1289	1947.4
Image 3	47.7750	118.8069	44.3073	1963.1
Image 4	48.1424	123.2526	43.7317	1912.5
Image 5	47.0974	111.0237	43.0457	1852.9
Image 6	34.5682	31.7159	43.8534	1923.1
Image 7	46.7147	106.8546	44.5588	1985.5
Image 8	46.0043	99.5266	43.7054	1910.2

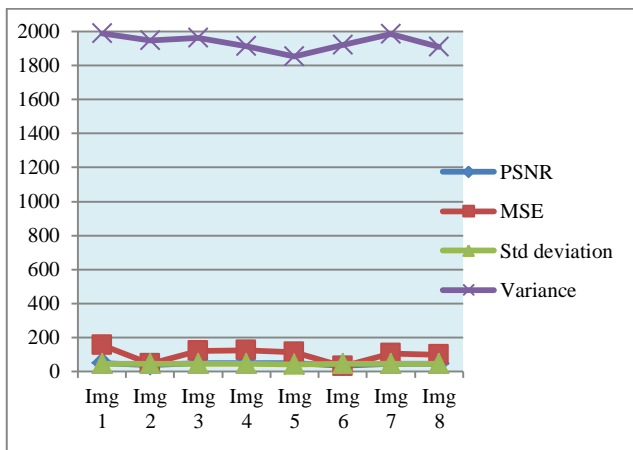


Figure 6: Graphical representation of Simulation results

For the analysis of an image for the transmission, eight images have been taken as test images as shown in Fig.5. Results show that a high better PSNR is achieved using MATLAB simulation. When GMSK is used for image processing, it actually is preserving the quality of image. All parameters achieved same values as 8 images analyze by simulating it. The executed results of the simulation are shown in Fig 6.

5. Conclusion

Hence, in this paper the modulation and demodulation has done using image processing. Application can be analyzed by using the parameters such as MSE, Std. Deviation, variance & PSNR. By using GMSK modulation and demodulation processing of an images gives good Peak Signal to Noise Ratio (PSNR) i.e. 50.3521 and got similar values for different images. Also it is observed that all parameter for all 8 images got similar values.

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