IMAGE TRANSFER THROUGH DIGITAL MODULATION TECHNIQUES OVER WIRELESS CHANNEL

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Abstract:-The objective of analog modulation is to transfer an analog baseband signal. The objective of digital modulation is to transfer a stream of bits of digital signals. The work reported that at low value of SNR, different modulation technique performs in different way. The quality of received image varies on changing the modulation techniques. It is noted that 64QAM is better than QPSK and 16QAM at SNR of 4 dB and 8 dB while all techniques are good at 40 dB. The simulation of proposed work is done on MATLAB. The input image of origin is applied on the modulation/demodulation techniques such as QPSK, 16-QAM and 64-QAM in the communication system. The advantage of the currently designed system is that, when the channel is under a condition of high noise, the system generates a quality of image worse rather than completely lose the transmitted image. The simulation is performed, when SNR value is 5 dB, 10 dB and 50 dB. By using 64-QAM modulation technique, which carries higher data rates, this is essential for image transmission. Modulation techniques such as 64-QAM provide better results than the other modulation techniques such as QPSK and 16-QAM under condition of higher channel noise with Signal to Noise Ratio is 8 dB.

Keywords:- SNR, QPSK, 16-QAM, 64-QAM and QPSK.

INTRODUCTION

An accurate, reliable and efficient image transmission over wireless channel at low SNR has been a challenge for engineers. To solve this problem study of image processing and digital communication system is carried out. The objective of this study is to provide a sense of perspective on the beginning of image processing in digital communication system and significance on current and forthcoming areas of the application of image processing. An image can be defined as a function x and y of two dimensions, where the coordinates space are x and y, and the amplitude of the fats of any (x, y) pair of coordinates is called the image gray level at this point. When x and y values is the amplitude of fare all finished, distinct quantities, than it is called as digital image. The vision is the most advanced of our sense; it is therefore not surprising that images play the main significant task in the human observation. But, different humans, who are restricted to the optical band of the EM, imaging equipment wrap approximately the whole electromagnetic spectrum, from radio to gamma waves. They can activate on the images produced by the origins that humans aren't used to relate with images. These include ultrasound, electron microscopy, and computer generated images.

Additionally, image processing in digital covers a broad and changed field in the applications.There is no universal arrangement between the authors as to know where stops of image processing and separate regions, for example computer vision and the image analysis. It occasionally happens that a difference is created by the definition of image processing for example an order in which together the output and input images are processed. That it is a limitation and limit somewhat artificial. Such as, below this definition, yet the small assignment of the calculation of the average intensity of an image (which provides a unique number) would not be considered as a processing operation of the image. On the other hand, there are areas such as the vision by computer whose critical objective is to utilize computers to follow the human visualization, together with studying and be proficient to create inferences and obtain measures based on visual i/p. This region itself is a division of Artificial Intelligence whose purpose is to imitate the human brainpower.
The area of the Artificial Intelligence is in its early stages of embryonic development in terms of development, progress has been much slower than expected. The area of the analysis of images (also called the understanding of the image) is in image processing and the computer between visions. There are no clear borders, in the continuum of treatment of images to one end of the vision by computer to the other. However, a useful paradigm is to regard 3 types of computerized procedures: low, medium, process of high level. Process of low level involves primitive operations such as image pre-treatment to reduce the noise, the improvement of contrast, and the definition of the contours. A process of bottom level is categorized by the concept that it's two i/p and o/p images. Therefore the central level of treatment on the images includes such works as the segmentation and the explanation of these things to decrease them to an appropriate form of computer

processing and identification of separate things [2].
A process of intermediate level is categorized by the concept with the aim of its i/p's are typically images, but its results are attributes extracts of these images. At last treatment of upper level implies "Making Sense" of a set of known objects, as in the analysis of the image, and, finally. the variety of executing the cognitive functions normally associated with the vision.

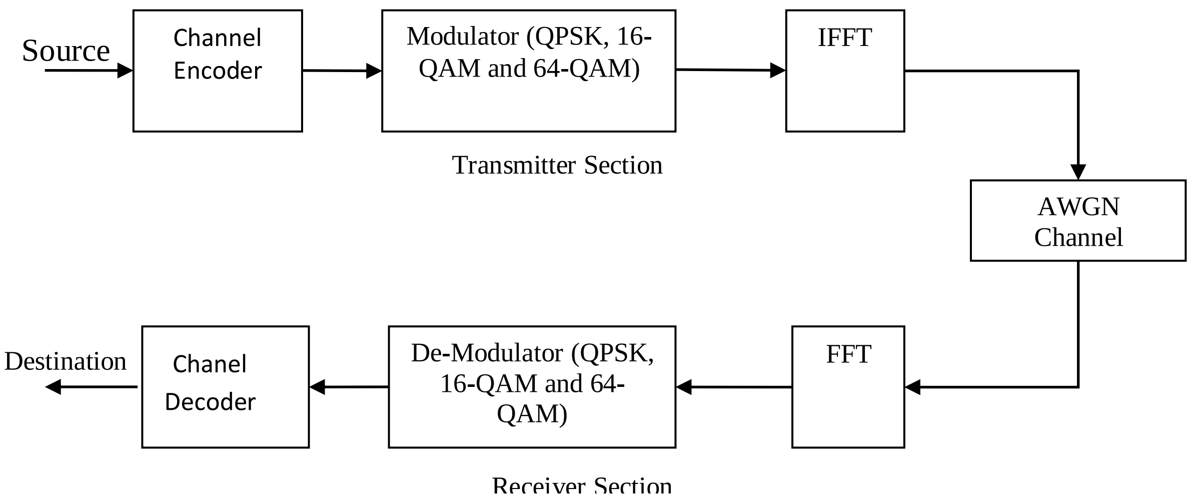
LITERATURE REVIEW

H. Meng, Y. L. Guan et. al [12] presented spread of coding, etc. a easy way is a distortion but it provide the signal degradation and distort the BER. Some more techniques are far from best techniques that this, but they need more information, so that the transmission speed decreases. On the reduction AWGN, other aspects such as the complexity, transmission speed, BER, error correction etc. is also taken into consideration. In G. April, Mr Tlich et. al. have done a lot of work and research on the effectiveness and transmission OFDM AWGN reduction. They have proposed, some of them have established various techniques to reduce the AWGN. Some of them have worked on the technical Decoupage; some of them have worked on PTS, technical interference. The best and effective method to reduce the AWGN with correction of errors, less complexity, higher rate of code, reduced by means of encoding techniques BER [13]. Many of the codes are used to minimize the AWGN, but often used codes are Golay complementary codes. Other uses various schemes to create sequences of efficient to minimize the AWGN to minimum level with a better error correction and reduces BER. In C.E. Shannon et. al. identified a modification of the constructions from which all sequences Golay and known pairs of length 2m can be obtained, and showed the importance of the Turin of construction and its possible variations [14-16]. They have also examined the Golay sequences and pairs that can be obtained from a pair of initial Golay arbitrary (a, b) by iterative use of the Budisin"s construction, including the effect of reversal of intermediate sequences.This document analyzes the different techniques of modulation used for the radio performed by software. The DTS technologies are important from the point of communication system future mobile because of its operational capabilities multimode and reconfigurable [17]. The selection of regime of modulation depends on of bit error rate (BER), signal to noise ratio (SNR), and the available bandwidth. The basic criteria for the best technique of modulation are the effectiveness of the power supply, a better quality of service, profitability, the effectiveness of the bandwidth and the complexity of the system. The quality of the service provided by wireless communication services can be greatly improved thanks to the help of correct selection of modulation technique. It will serve to increase the radio coverage, reduce the consumption of energy. In recent years, an important transition is produced from the modulation techniques analog-to-digital that are currently used in all areas of communication systems by satellite, cellular phones, wireless networks. The modulation is a method which is used to encode digital information into an analogue signal. Although there are various techniques implemented for best performance of modulators but there are still various techniques yet to be implemented for the simple programmable interface for switching between the different techniques for low power and the consumption of FPGA resources [18]. Here in this paper a complete record of all the techniques implemented for the design of digital modulators and demodulators and their various advantages and disadvantages are discussed such as a new improved technique can be implemented in the future. The proposed methodology implemented here is an effective technique for the implementation of the modulator and demodulator, also the design uses a single demodulator to demodulation of any type of modulation therefore records FPGA of space and resources. But other improvements can be made in the future. This communication technique is supposed to be effective in the noisy environment also. This document demonstrates the effect of an image transmission by AWGN channel using phase shift key (PSK) system and transmission of compressed images by AWGN channel. Image compression is one of the notable features in wavelet transform. In general, compressed image takes less time & Space for crossing the channel as compare to the original image. Bit error rate (BER) & the root mean square error (RMSE) values decreases, and the Peak Signal/Noise Ratio (PSNR) values increases for different signal to noise ratio (SNR) value on the transmission of the simple image & image compressed by AWGN channel [20]. Table 2.2 shows the results of an iTunes image on AWGN channel. It has been observed that with the increase of SNR values BER values decreases, RMSE values also decreases and values of PSNR increases. Table 2.3 presents the analysis of the performance of the image to gray scale compressed with channel and without channel using WT. It has been observed that with the increase of SNR values BER & RMSE value decreases and PSNR increases with AWGN channel. RMSE & values of PSNR remain constant for without AWGN channel. This paper present a 4-phase Golay sequence pair of length S=5 (Mode 8) is built from a sequence of Barker of the same length, including even the indexed elements have been prescribed [21]. This has explained how the origin of the 4-phase pairs of seed of Golay length 5 and 13. Through the construction cannot be achieved new 4-phase Golay pairs of sequences, because there are not any of the sequences Barker of o 1 of 13. Kural E.Yavuz et. al. have done an excellent job in the field of the creation of the best Golay complementary sequences [22]. Nothing in above has implemented the generated sequences Golay with MATLAB to give notice of the actual performance of the system OFDM. It is described in the origin to achieve 4-phase Golay sequences and pairs of sequence of the same Golay length at more than 26. The construction to three floors can be used to obtain counts relating to minimum 4-phase Golay sequences and pairs of sequences of a length of more than 26, but a result more general of Proposal 9 is necessary for certain lengths [23].

PROPOSED METHODOLOGY AND SIMULATION RESULTS

This study explains the basic principle of image transmission over wireless channel using various digital modulation techniques. Aim of this study is to compare the transmission quality of modulation technique when applied to image transmission rather than transmission of audio signal. System model, algorithm and flow chart of proposed work is described here in this section. The results of modulation techniques such as QPSK, 16QAM and 64QAM are compared.The model is a simple model of a wireless digital communications system. The model is broken into its constituents of functions or modules, and each of these in turn is described in terms of its impact on the data and the system. Since this model includes the whole of the system, both the source code and the equalization of the channel. are briefly described. Modulation/de-modulation and IFFT/FFT are the main blocks of this wireless digital communications system simplified.

output of the source of a binary sequence and the channel coder (often called a modulator) treats the binary sequence for the transmission on the channel. The last three blocks consisting of detector/Demodulator, a decoder channel, and source of the receiver of form decoder. The destination represents the client waiting for the information. It may be a human or a storage device or to another station of treatment. In all cases, the source of the liability of the decoder is to recover the information of the channel decoder and to transform it into an appropriate format for the destination. This transformation includes the digital to analog conversion (DAC) if the destination is a human being waiting to hem or view the information or if it is a storage device analog. If the destination is a storage device digital, the information will be retained in its digital state without a controller. The channel decoder (demodulator) creates the binary sequence entering (hopefully) reliable manner, and the source decoder creates the source output .



Communication systems than the initial change the output of the source in a binary sequence and after that change this binary sequence in a format proper for transmission on physical media particular, such as the optical fiber, cable, electromagnetic radiation in space and twisted pair cable. The Digital Communication systems, by description, are of communication systems that utilize such a numeric sequence as an interface involving the input channel and the source.

Figure 4.1 in the model of digital communication in basis the first three blocks of the diagram (source encoder, modulator and channel encoder) together form the transmitter. The Source represents the message to transmit that includes the voice, video, and the image or text data among others. If the information has been acquired in analog form, it must be converted to digital format to make our communication easier. This conversion to analog to digital (ADC) is accomplished in the block of encoder source. Position a binary interface linked with the channel and source. The source encoder converts the

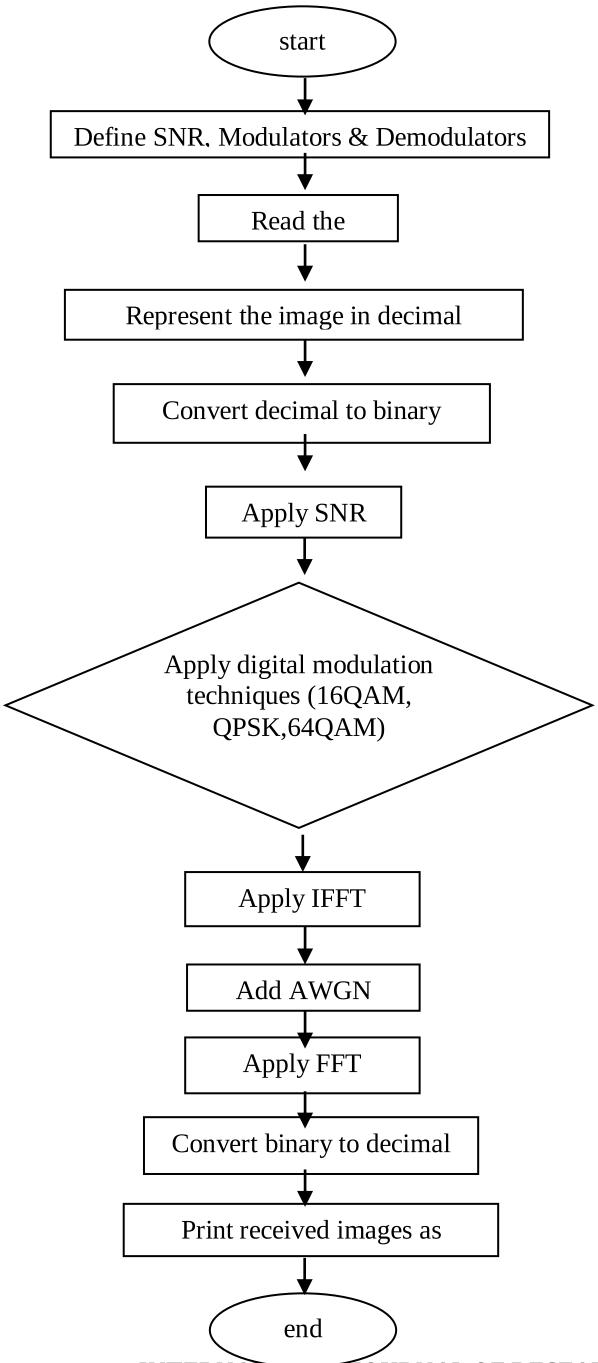
inverse fast fourier transform/ fast fourier transform (ifft/fft)

In order to perform frequency domain data in the time domain correlates IDFT the frequency domain the input data with its orthogonal basis functions which are sinusoids at certain frequencies. In other ways, this correlation is equivalent to the mapping of the input data on the basis of functions sinusoidal. In practice, the digital communication systems employ a combination of Fast Fourier Transform (FFT) and Fast Fourier Transform inverse (IFFT) blocks which are mathematically equivalent version of the DFT and IDFT.

FLOWCHART

Side transmitter, a digital communication system treats the source symbols as if they are in the frequency domain. These symbols are feed to a block IFFT which brings the signal in the time domain. If the N numbers of subcarriers are selected for the system, the basic functions for the IFFT are N sinusoids of orthogonal frequency separate and receive n symbols to IFFT a moment. Each of the symbols of their valuable contribution complex N determines the amplitude and phase of the sinusoid for that the subcontractor. The output of the IFFT is the sum of all N and the fact of a sinusoids only digital symbol. The length of the digital symbol is NT where T is the symbol of IFFT entry period. In this way, IFFT block provides a simple way to modulate the data on n sub-carriers orthogonal.On the receiving side, the block of FFT performs the reverse process on the received signal and the return in the frequency domain.

The diagram in Figure 4.1 illustrates the switch between the frequency domain and time in a digital communication system.



ALGORITHM

- Define SNR, Modulator and Demodulator objects.
- Read the image.(image and code should be in the same directory)
- Represent the image in decimal number.
- Convert decimal to binary.
- Apply SNR.
- Apply digital modulation techniques (QPSK, 16QAM, 64QAM)
- Apply IFFT.
- Add AWGN.
- Apply FFT.
- Convert binary to decimal.
- Print received images as output.

SIMULATION RESULTS

The simulation of the proposed algorithm is done in MATLAB. Simulation results are based on different modulation techniques at different values of signal-to-noise.

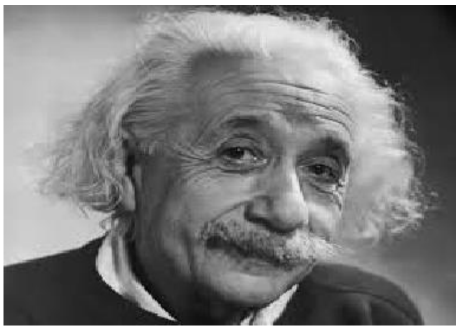


Fig.4.1: source image

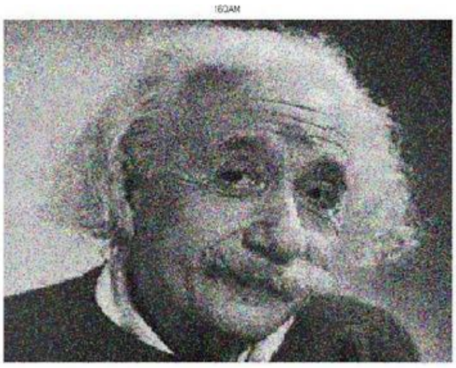


Fig. 4.2: 16QAM, SNR=5dB

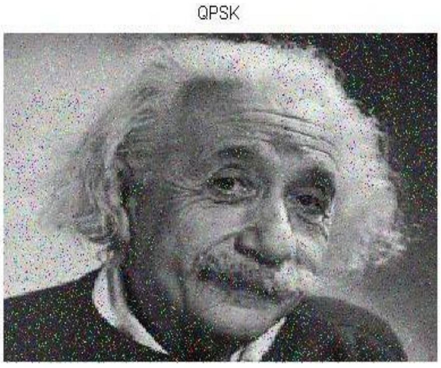


Fig.4.3: QPSK, SNR=5dB

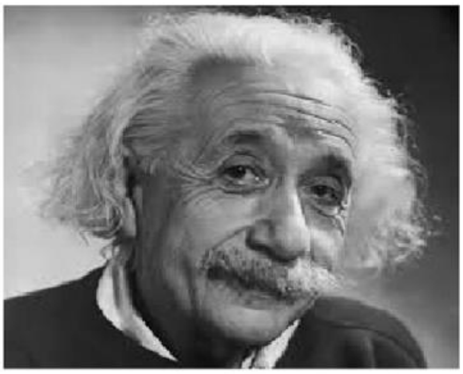
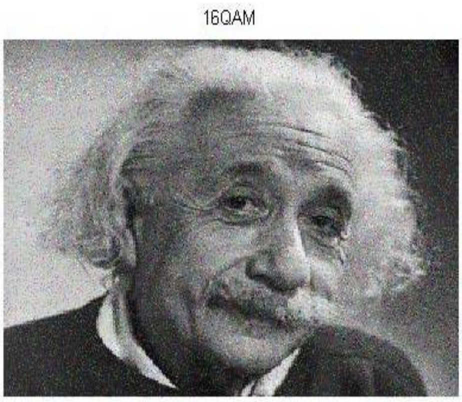


Fig. 4.4: 64QAM, SNR=5dB

Fig.4.5: 16QAM, SNR=10dB



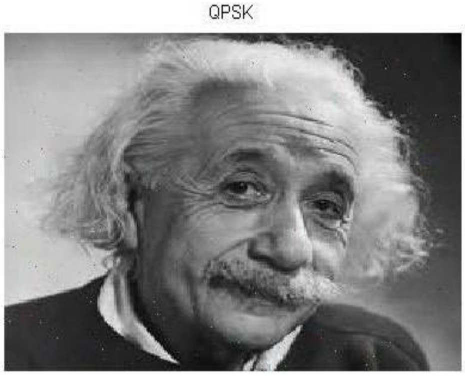


Fig.4.6: QPSK, SNR=10dB

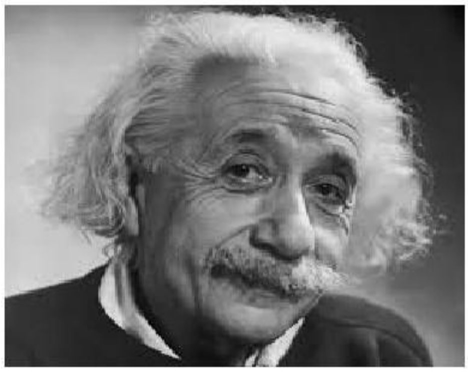


Fig.4.7: 64QAM, SNR=10dB

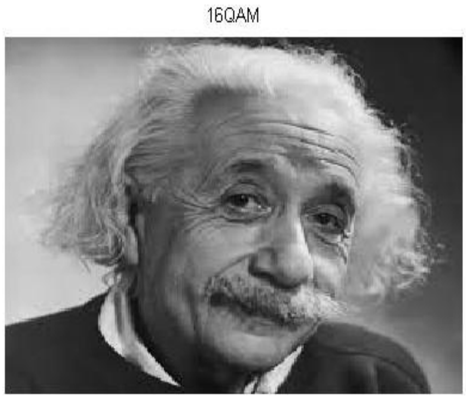


Fig.4.8: 16QAM, SNR=50dB

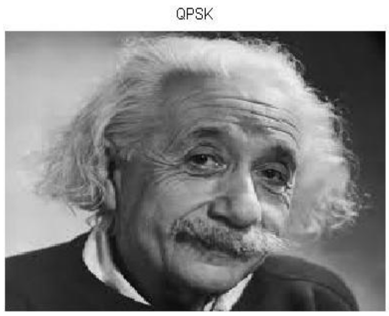


Fig.4.9: QPSK, SNR=50dB

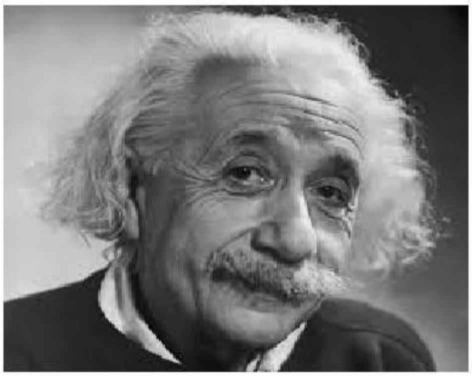


Fig.4.10: 64QAM, SNR=50dB

is discussed in this section, containing the results step by

step and discussions. The architecture of this wireless The initial phase before the wireless transmission is to transmit the message generated, where this message could be either randomly generated binary values, its audio or image digitally processed. Simulation of this part uses the numbers of pseudo-random distributed evenly, using the "rand(m,n)" which produces a Function 1 by 2500 values pseudo-random, where 2500 represent the number of bits. In order to produce the binary values random, the products previously the values should be rounded to the nearest whole number value. This is achieved by the use of function "round", which product 1 by 2500 bits (ones and zeros). The kernel of the wireless transmitter is the Modulator, which allows you to modulate the Input data stream image by image. The data are divided into images based on the variable symbol by frame, which corresponds to the number of symbols by image by carrier. However, the number of carriers could not be much larger than 1000 in this simulation, therefore the total number of symbols per frame would generally be of less than 10,000 inhabitants. It is an experimentally number of reasonable symbols a frame must keep for this program of MATLAB to operate effectively. If the total number of symbols in a stream of data to be transmitted is less than the total number of symbols per frame, the data would not be divided into frames and would be modulated all at once.The presentation of the digital modulation techniques on the basis of wireless digital communication, by doing this, a technical calculation of high level language called MATLAB has been used to design and implement the digital communication system described. Modulation/ De- Modulation ".m" must be executed while other M-Files will be invoked accordingly. The data source for this simulation is taken from an 8-bit grayscale (256 levels of gray) bitmap image file (*.bmp) based on the choice of the user. The image data will then be converted to the size of the symbol (bits/symbol) determined by the choice of QPSK of four variations provided by this simulation. The converted data will then be separated into multiple frames by the wireless transmitter. The modulator 64-QAM allows you to modulate the data image by image. Before the output of the transmitter, the time signal modulated in cascade with the protections of the chassis inserted between as well as a pair of identical headers added at the beginning and at the end of the data stream. The communication channel is modelled by the addition of Gaussian white noise and amplitude clipping effect.Noise of the channel is modelled by the addition of a Gaussian white noise (AWGN) defined by:

$$AWGN = \sqrt{\frac{\text{variance of the modulated signal}}{\text{linear SNR}}}$$

The receiver detects the beginning and the end of each frame in the signal received by an envelope detector. Each temporal signal detected is then demodulated in useful data. The modulated data are then converted into a size of 8 bit word data used to generate an image file output of the simulation.
From the figure 4.4, the first image in the left column is the input image of origin, the image of a gray scale is the image to which the modulation/demodulation techniques such as QPSK, 16-QAM and 64-QAM in the communication system will be applied. As results shown in figure 4.4, like many of the other systems of digital communication, the performance of this system is acceptable that, up to a certain level of noise from the critical channel. In other words, if the noise level is raised above this critical level, the performance of the system cannot very quickly. Such questions may strongly affect the performance of the wireless digital communications, where the fall of signal can lead to a decrease in the reliability of the communication. The advantage of the currently designed system is that, when the channel is under a condition of high noise, the system generates a quality of image worse rather than completely lose the transmitted image.

Table 4.1: Comparison of received Image quality of various digital modulation techniques at SNR values are 4, 8 and 40 dB

SNR Value	QPSK	16-QAM	64-QAM
4 dB	Good	Poor	Excellent
8 dB	Good	Poor	Excellent
40 dB	Same	Same	Same

The simulation results are performed, when SNR value is 4 dB, 8 dB and 40 dB. By using 64-QAM modulation technique, which carries higher data rates, this is essential for image transmission. Modulation techniques such as 64- QAM provide better results than the other modulation techniques such as QPSK and 16-QAM under condition of higher channel noise with Signal to Noise Ratio is 8 dB. From figure 4.5, When SNR value is 40 dB, cannot identify which technique is better because all results are almost same. Table 4.1 shows the comparison of noise mitigation using various digital modulation techniques at SNR values are 8 and 40 dB.

CONCLUSION

The aim of this research work was image transmission over wireless digital communication and examines various digital modulation techniques such as QPSK, 16-QAM and 64-QAM using Additive White Gaussian Noise (AWGN) channel and know the best suitable modulation technique for image transmission over wireless digital communication system. The image transmission over communication system using digital modulation techniques is performed and the results are obtained through a high level technical language called MATLAB. MATLAB was introduce for designing and implementing wireless digital communication system. Like many of the other wireless digital communication systems, the performance of this system is acceptable that, up to a certain level of noise from the critical channel. In other words, if the noise level is raised above this critical level, the performance of the system cannot very rapidly. The advantage of the currently designed system is that, when the channel is under a condition of high noise, the system generates a quality of image worse rather than completely lose the transmitted image. The simulation results are performed, when SNR value is 8 dB. By using 64-QAM modulation technique, which carries higher data rates, this is essential for image transmission. Modulation techniques such as 64-QAM provide better results than the other modulation techniques such as QPSK and 16-QAM under condition of higher channel noise with Signal to Noise Ratio is 8 dB.

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