An Attempt for Digital Image Processing Using Shiftkeing Techniques

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Abstract

Digital Image Processing (DIP) is the process of employing various computer methods to process digital pictures. Pattern recognition, remote sensing, picture sharpening, colour and video processing, and medical applications have all used digital image processing. Today's life revolves around the usage of telecommunications. In the world of communication, using Carrier Wave Modulation methods for image processing is a difficulty. This paper explains how to use shift keing techniques to process digital images. The Bit Error Rate (BER), Peak Signal to Noise Ratio (PSNR), and Available Bandwidth all influence the modulation technique used. Power efficiency, higher Quality of Service, cost effectiveness, bandwidth efficiency, and system complexity are the main factors for selecting the optimum modulation technology.

Keywords: *Digital image; pixels; modulation; electronically*.

I. INTRODUCTION

Previously, digital image processing was mostly employed in the newspaper industry to improve the appearance of photos or to transform black and white images to colour images. Digital pictures were transferred electrically between London and New York in the 1920s. The first Bartlane cable picture systems could only code an image with five grey levels; in 1929, this was increased to 15 grey levels. After the introduction of digital computers and related technologies, such as picture storage, display, and transmission, actual digital image processing began. Powerful computers gave birth to serious digital image processing in the 1960s. The Jet Propulsion Laboratory in California analysed images of the moon acquired by the Ranger 7 US satellite. At the same time, digital image processing was being used in astronomy, medical image processing, remote sensing, and other fields. The usage of digital image processing methods has increased dramatically since 1960. These methods are currently employed in nearly every aspect of our lives. They have uses in defence, astronomy, medicine, law, and other domains.

Digital pictures are all around us in today's digital world. A visual depiction of an item, a person, or a scene is called an image. A digital image is a two-dimensional function f (x, y) that depicts the projection of a three-dimensional scene onto a two-dimensional projection plane, where x, y indicates the picture element or pixel position and contains the intensity value. When the x, y, and intensity values are discrete, the image is referred to as a digital image. A digital image is a matrix representation of a two-dimensional image utilising a finite number of point cell elements, also known as pixels, in mathematics (picture elements, or pels). In grayscale photos, a single value indicating the pixel's intensity (typically in the [0, 255] range) is sufficient; in colour photographs, three values (representing the quantity of red (R), green (G), and blue (B)) are kept. A binary picture is one in which there are only two levels of intensity.

II. DIGITAL IMAGE FILE TYPES

These days, there are a variety of digital picture file formats to choose from. JPEG, GIF, TIFF, PNG, and BMP are the most prevalent picture file formats. The compression technique used to reduce the size of the picture file determines the image file type. If colour has been employed, images in different file formats may differ in colour. In its most basic form, a picture can only have two intensities: black and white, and each pixel's intensity can be represented with only one bit.

- **Tagged Image File Format (TIFF)**

This format is quite adaptable, and it may use either lossy or lossless compression techniques. The compression technique's information is kept in the picture itself. TIFF files, in general, employ a lossless picture storing method and are hence fairly big.

- **Portable Network Graphics (PNG)**

This format is a lossless storage format that compresses images by using patterns in the picture. PNG compression is reversible, which means the uncompressed picture is identical to the original image.

- **Graphical Interchange Format (GIF)**

This format generates a table with up to 256 colours from a palette of 16 million. If the picture to be compressed contains fewer than 256 colours, the GIF image will have the same colour as the original. If the number of colours in the picture is larger than 256, the GIF uses a table of the 256 colours available to estimate the colours in the image.

- **Joint Picture Experts Group (JPG or JPEG)**

This is a format designed for pictures and continuous tone images with a large number of colours. High compression ratios may be achieved with JPEG files while keeping image quality.

- **RAW**

On some digital cameras, this is a lossless image format. Although these files are short, the format is manufacturer-dependent, so you'll need the manufacturer's software to see them.

- **Bitmapped Image (BMP)**

Microsoft created the Bitmapped Image (BMP) format, which is an uncompressed proprietary format.

III. APPLICATIONS OF DIGITAL IMAGE PROCESSING

Digital image processing techniques are now used in a number of applications; some common applications are given below:

- **In medicine**

Picture processing is used in a variety of medical equipment for a variety of reasons, including image enhancement, image compression, object detection, and so on. Image processing-based medical equipment includes X-rays, computed tomography scans (CT scans), positron-emission tomography (PET), Single-photon emission computed tomography (SPECT), nuclear magnetic resonance (NMR) spectroscopy, and Ultra-Sonography.

- **In agriculture**

In the subject of agriculture, image processing is critical. Image processing is used to automate a variety of important operations such as weed identification, food grading, harvest control, and fruit harvesting. The employment of imaging techniques in various spectrums, such as hyper spectral imaging, infrared, and others, allows for accurate irrigated land mapping, calculation of vegetation indices, canopy measuring, and so on.

- **In weather forecasting**

Image processing is also important in weather forecasting, such as rainfall, hailstorms, and floods predictions. Meteorological radars are commonly used to identify rain clouds, and systems utilize this information to anticipate the severity of the rain.

- **In photography and film**

For the goal of improving picture quality, retouched and spliced pictures are often employed in newspapers and publications. Many complicated sequences in movies are made using image and video editing software that uses image and video processing procedures. To anticipate the success of forthcoming films, image processing-based algorithms are utilized. Latent View used image analytics to extract over 6000 movie posters from IMDB, together with their metadata (genre, actors, production, ratings, and so on) in order to anticipate the films' performance for a worldwide media and entertainment corporation. Machine Learning (ML) methods and image processing techniques were used to assess the colour schemes and objects in the movie posters.

- **In entertainment and social media**

Face detection and recognition are frequently employed in social networking sites, where the system automatically recognizes and suggests tagging the person by name as soon as the user submits an image.

- **In security**

Biometric verification technologies ensure high levels of authenticity and privacy. Humans are recognized using biometric verification procedures based on their behaviors or features. Video surveillance systems are being used to monitor people's movements and activities in order to trigger alerts for particularly bad behavior. Several banks and other government agencies are employing image processing-based video surveillance systems to detect illegal activity.

- **In banking and finance**

In the realm of financial services and banking, the usage of image processing-based approaches is quickly rising. Customers can deposit checks electronically utilizing mobile devices or scanners using a banking service known as "remote deposit capture." The check image's data is extracted and utilized instead of a physical check. Face detection is also employed in the authentication of bank customers. To secure sensitive information, several banks utilize 'facial-biometric' technology. Signature verification and recognition play an important part in validating consumers' signatures. However, a reliable mechanism for verifying handwritten signatures is still in the works. Because handwritten signatures are inherently imperfect, with edges that aren't always sharp, lines that aren't completely straight, and curves that aren't usually smooth, this method presents several obstacles.

- **In marketing and advertisement**

Some businesses use image-sharing on social media to track the impact of their latest items or advertisements. Images are used by the tourist department to promote tourist locations.

- **In defense**

Image processing, in conjunction with artificial intelligence, is helping the military meet two basic requirements: autonomous operation and the utilization of outputs from a varied variety of advanced sensors for forecasting danger/threats. Remote sensing technology were used to reconnoiter enemy terrain during the Iran-Iraq conflict. In order to identify, locate, and destroy enemy weapons and defense systems, satellite photos are studied.

- **In industrial automation**

In the field of industrial automation, image processing has never been used before. The 'Automation of Assembly Lines' technology detects the components' location and orientation. The moving bolts are detected using bolting robots. Image processing allows for automated examination of surface imperfections. The primary goals are to assess item quality and spot any anomalies in the goods. Shape automation is also used in several sectors to classify items.

- **In forensics**

Tampered papers, such as contested wills, financial paperwork, and professional business documentation, are frequently utilized in criminal and civil trials. Passports and driver's licenses are regularly tampered with in order to be used as identifying evidence unlawfully. The legitimacy of such dubious papers must be determined by forensic agencies. Due to the availability of powerful document editing technologies, detecting document fraud is becoming increasingly difficult. To improve his craft, the forger employs cutting-edge technology. To ensure that computer scan documents are legitimate, they are copied from one document to another. Forgery isn't only limited to documents; it's also becoming more common in the realm of photographs.

IV. BASIC MODULATION TECHNIQUES

4.1 QPSK

The basic goal of a digital communication system is to offer dependable performance, lower the chance of error, and maximize channel bandwidth usage. QPSK is a continuous wave (CW) modulation technology that meets all of the communication system's criteria. Quadrature Phase Shift Keying (QPSK) is an acronym for Quadrature Phase Shift Keying. QPSK is a multi-level, or more precisely, a four-level modulation technique that can only represent two levels of data, namely 0 and 1.

$V_{QPSK} = \sqrt{P_s}\, b_0(t) \sin \omega_c t + \sqrt{P_s}\, be(t) \cos \omega_c t$ OR

$V_{QPSK} = \sqrt{2P_s} \cos [\omega_c t + (2m+1) \prod/4]$, m=0,1,2,3

4.2 FSK

The primary goal of a digital communication system is to deliver dependable performance while reducing the likelihood of error and maximizing channel bandwidth usage. Frequency Shift Keying (FSK) is an abbreviation for frequency shift keying. The sinusoidal carrier's frequency is altered between two discrete values here. A binary'0' of

original data is represented by one of these frequencies (fн). The carrier's amplitude and phase remain unchanged. That is, according to binary s/gs, we have two distinct frequency s/gs. Allow for a phase change of by.

i.e. fн = fc+Ω/2π for symbol '1' fL =fcΩ/ 2π for symbol '0'

4.3 BPSK

Using the NRZ encoder, the binary sequence d(t) is transformed to NRZ s/g, b(t). The PN sequence c(t) created by the PN code generator is then modulated using the NRZ s/g b(t). The transmitter employs a two-stage modulation scheme. The first stage employs a product multiplier with i/ps of b(t) and c(t), whereas the second stage employs a BPSK modulator. For BPSK modulation, the modulated s/g at the o/p of the product modulator, i.e. m(t), is utilised to modulate the carrier. As a result, the transmitted s/g, x(t), is a direct sequence spread BPSK s/g, also known as DS-BPSK s/g. The carrier for BPSK is provided by,

V carrier (t) =√ (2Ps) sin(2∏fct)

The o/p of the BPSK modulator i.e. x(t) is terminated. x(t) is given mathematically as

x(t) = m(t) x Vcarrier (t) = m(t) x √2Ps sin (2∏fct)

but m(t) = + 1

hence x(t) = √2Ps sin (2∏fct)

As a result, the phase shift of x(t) is 0 degrees for a positive m(t) and 180 degrees for a negative m(t) (t).

V. IMAGE PROCESSING AND MODULATION TECHNIQUES

To begin, we may apply fundamental modulation techniques to use digital picture processing. For this, we must compare several pass band modulation techniques for various parameters.

Table 1: Comparison of Binary Modulation Schemes

No.	Technique			requirement
	Binary Modulation Scheme			
01	Binary Amplitude Shift Keying	BASK	Non coherent	$2R_B$
02	Binary Frequency Shift Keying	BFSK	Non coherent	$2R_B$
03	Binary Phase Shift Keying	BPSK	Coherent	$2R_B$
04	Differential Phase Shift Keying	DPSK	Non coherent	$2R_B$
	Quadrature Modulation Scheme			
01	Quadrature Phase Shift Keying	QPSK	Coherent	$2R_B$
02	Minimum Phase Shift Keying	MSK	Coherent	Less than QPSK

Table 2: Comparison of M-ary Modulation Schemes

	M-ray Modulation Scheme			Where $M = 2^N, N$
01	M-ary Phase Shift Keying	M-ary PSK	Coherent	$2 R_b / N$
02	M-ary Quadrature Amplitude Shift Modulation	M-ary QAM	Coherent	$2 R_b / N$
03	M-ary Frequency Shift Keying	M-ary FSK	Coherent	$M 2 R_b / N$

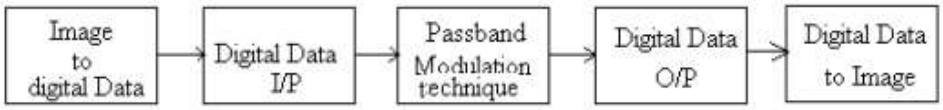

Fig 1: Digital Image processing by using Pass Band Modulation technique

VI. CONCLUSIONS

As a result, this research conducts a comparative examination of several pass band modulation schemes. We can also use similar all pass band modulation methods to implement picture processing. Important characteristics like as BER and PSNR can be used to evaluate the application. In image processing, the BER should be low and the SNR should be high as well. If this is the case, picture processing was carried out using Pass band modulation methods.

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