DOI-10.53571/NJESR.2023.5.3.46-64

Compression Of Data Transmission In Health Care Monitoring System

Sreevidya V.S
Lecturer In Computer Engineering,
Government Polytechnic College
Punalur

(Received:20Feburary2023/Revised:9March2023/Accepted:20March2023/Published:24March2023)

Abstract

In the context of computer communication, data transmission and compression are gaining prominence. In the medical community, these methods are frequently utilized for data exchange in hospital computer networks. PC based displaying applications act as potential methodologies in planning simple to-assess clinical information correspondences. A simulation tool for managing medical data compression and transceiver over noisy IEEE 802.11b Wi-Fi is the goal of this study. Medical information technologies, wireless telemedicine systems, transmission technologies, hospital network topologies, and communication networks and services are all briefly discussed in this paper. In addition, related research is reviewed in this paper, particularly studies on Wi-Fi data transmission standards and algorithms for data compression.

Keywords: WI-FI, IEEE 802.11b, Medical Data, Compression And Transceiver, ICA, DCT, SPIHT and JPEG2000

Introduction

The support for medical services that makes use of telecommunications is known as telemedicine. The ancient Greek language gave rise to the prefix "tele," which means "far" and means "distance." As a result, the term "telemedicine" literally translates to "distance-based medical care." The use of telecommunications in medical applications includes transmitting and receiving medical data between pairs of transmitters[1]. Medical data can range from a doctor's consultation to refined data obtained from a human body.

Through the use of inexpensive telecommunication, telemedicine ensures that necessary medical advice is delivered over significant distances, particularly in rural areas. Applications for telemedicine use multimedia equipment and telecommunications systems to deliver medical care, diagnosis, treatment, and education as well as medical information. Typically, physicians in telemedicine treat patients via store-and-forward consultations or interactive videos.

Through monitors and specially modified devices, medical professionals can communicate directly with distant patients through interactive videos. Doctors who use store-and-forward methods send images, X-rays, and patient data directly to a specialist's computer. The specialist then sends the diagnosis back to the local doctor, who treats patients and ensures that follow-up care is available[2] after analyzing the information that was received.

Portable and mobile personal computers and workstations have followed a growing trend in recent years. Access to network services that are comparable to those provided by "tethered" networks is being demanded by an ever-increasing number of mobile users. Wireless systems and networks make it possible for mobile devices to communicate with one another and access large-capacity wired networks. Under the Institute of Electrical and Electronics Engineers (IEEE) project 802-recommended international standards for wireless local area networks (WLANs), the formation of study group 802.11 was initiated in order to meet the requirements for wireless data networking. Media access control (MAC) and physical layer (PHY) standards for local area wireless connectivity with fixed, portable, and mobile station standards were the goals of the 802.11 study group. Direct-sequence spread spectrum (DSSS), frequency-hopping spread spectrum (FHSS), and diffuse infrared are PHYs that must be taken into account.

Communication Networks And Services

Numerous medical and healthcare services are supported by communication networks. Multiple network categories are used in telemedicine to enable physicians to share ideas; Operations can be performed simultaneously by surgeons anywhere in the world, regardless of where they are performed; medical caretakers and paramedics can recover a patient's record paying little mind to overall setting. Networks are used to manage work and inventory in hospitals and clinics for patient care. Because telemedicine applications require the adaptability offered by wireless networks, this section focuses on the fundamentals of telecommunication technology.

Wireless Communications Basics

The exchange of information between various units is referred to as telecommunication. There are transmitters (the sender), receivers (the recipient), and channels in communication systems. The communication channel transmits information promptly, and the recipient receives information at a time. When sent and received information share similarities[3] and[4], this procedure appears straightforward. However, this is not always the case. Sadly, channels are damaged by additive noise, distortion, and attenuation, for instance [1]. Additive noise is introduced into and integrated into information, as depicted in Figure 1. The addition of noise taints the original data in some ways. Information transfer over a certain distance can be restricted in telemedicine systems to a few micrometers within devices or integrated circuit chips or to thousands of kilometers across continents.

Wired Versus Wireless

Remote correspondence frameworks became well known due to upgrades in innovation, which effectively settle numerous trustworthiness and security gives that regularly confine utilization of remote innovation in cost-saving applications. When choosing a wireless method of communication, agility and accessibility are dynamic considerations. Albeit wired and remote interchanges are utilized far and wide, these kinds of correspondences highlight explicit contrasts.

Over a century ago, wired communications were used. Telephony innovations began when Bell and Gray developed the first telephone by using a microphone to pick up a person's voice, which is then reproduced by a speaker. This was the result of the invention of telegraphy in the middle of the 19th century. The base of the electric wires that are used in telecommunications was shaped by this invention. C. Chappe used a line-of-sight communication channel to send visual telegraphs at the beginning of 1794, which marked the beginning of wired communication.

The development of wireless technology began in 1887, the same year that the first telephone was introduced. When Hughes and Hertz used a park gap transmitter to create radio waves, this technology was developed. Faraday and Marconiat's fundamental wireless technology formed the foundation for radio broadcasting at the end of the 19th century. Television broadcasting began in the 1930s, three decades after the first radio was introduced. In 1941, commercially licensed television stations opened in Pennsylvania and New York. Germany created the first electromechanical television in 1984. Radio and television broadcast have been referred to as simplex communications because they are both one-way communication systems. Two-way radio communication was widely used during World War I, but its commercial use began after World War II. Although Stubblefield held the US patent for the wireless telephone in 1908, it wasn't until the 1980s that the Advanced Mobile Phone Service system was approved by the Federal Communications Commission that cellular phones became widely available[5]. Because it only enables users to communicate with one another without the use of any additional structures, the major development of wireless communications up to this point may be unclear to end users.

Since its introduction in Europe in 1991, the 2G Global System for Mobile Communications (GSM) has supported text messaging. After that, new structures like video calls, Multimedia Messaging Service, and Internet browsing were added by 2.5G and 3G. Speed of remote innovations headway over the course of the last many years can be pictured. As a result, wired and wireless technologies have evolved over more than a century and are now regarded as mature technologies[1].

It's interesting to note that both wired and wireless technologies are also referred to as "guided" and "unguided" media, respectively. The flowchart for guided versus unguided transmission medium was shown in Figure 2. Data running along a link is 'directed' through a decent way which is the actual link. In contrast, information in wireless communication is referred to as "unguided" because it does not follow a predetermined path. In conclusion, wired communication is more cost-effective and more reliable for short-distance transmission in telemedicine applications. Because of its high mobility and adaptability in transmission, wireless communication is more convenient. Telemedicine applications regularly utilize remote innovation as portability is exceptionally sought after-everybody scorns having wires tangling all around the body.

Data Transmission Speed

How much data moved in not entirely set in stone by transfer speed, which fills in as a significant wording in understanding themes connected with correspondences. The general rule is that high data rates are supported by similarly high data rates because channel bandwidth is fixed.

By combining numerous bits into a single baud, it is possible to increase the rate at which data is transmitted with fixed transmission medium bandwidth. A count of the number of electronic state changes per second is what is meant by the term "baud." For instance, a copper cable with 1 K bauds changes the voltage 1000 times per second. However, transmitting 1 000 data bits per second is essentially impossible with this cable. The transmitted data rate supported by particular channels is referred to as bandwidth. The reference involves recurrence groups of electronic signs during information transmission across channels. Consequently, variance between maximum and minimum frequencies is frequently used to measure channel bandwidths in hertz (Hz). For instance, the bandwidth of voice data transmission over telephone channels is 3.1 KHz, and the minimum frequency is 300 Hz, while the maximum frequency is 3 400 Hz.

Electromagnetic Interference (Emi)

EMI is the primary flaw in wireless communications; EMI's negative effects are more problematic than those of conducting cables. Because wireless transmitting devices have the potential to affect the operations of delicate medical instruments, this deficiency is primarily a risk in healthcare applications. outlined a variety of strategies for minimizing the effects of EMI on healthcare applications and preserving their operational reliability. Among the options, the use of the right material for medical instrument housing provided adequate protection; it can proficiently shield gadgets from superfluous obstructions as the powerlessness of all remote communicating gadgets to EMI from nearby transmitting sources can't be dealt with not truly.

Transmission Technology

Data Transmission

The physical transfer of data via communication channels like wires, wireless technologies, or physical media is referred to as data transmission. A hospital's interior or exterior, as well as large areas between countries, can be considered transmission areas. Emergency clinics use transmission of clinical information to help moves among different offices, which may conceivably or may not be on a similar organization.

Data transmission can immediately deliver medical findings to physicians in communities, in addition to direct patient contact. Instead of waiting for physical media to arrive, doctors use this technology to instantly access data. Specialists likewise get sufficiently close to a patient's clinical history, consequently further developing place of care administration. Patients do not need to carry or store physical media because they can receive their data exams electronically. Data can be accessed by doctors from a variety of locations, and they can prepare their data in advance.

Hyper-LAN/1 was confirmed as the first WLAN standard in 1995 by the European Telecommunications Standards Institute, whereas Hyper-LAN/2 was established in 2000. In contrast, the IEEE 802.11 WLAN standard gained widespread acceptance. 802.11 chipsets are standardized and integrated into mobile devices like laptops, PDAs, and mobile phones. Remote foundation gear (passages (APs)) is tolerably low-evaluated.

WLAN technology is developing quickly. Data rates of up to 2 Mb/s are supported by the original IEEE 802.11 standard. At the moment, 54 Mb/s speeds are typical for devices. The number of devices with multiple inputs, multiple outputs (MIMO) technology, which can support speeds of up to 300 Mb/s, is rising. Improvements in modulation techniques were incorporated into the 802.11 standards, which ensured interoperability with previous protocols. However, subsequent schemes are not controlled by new modulation schemes[7]. To maximize frame transmission, 802.11 can select any scheme from the most recent modulation schemes. Wireless devices demonstrate thus their adaptability to channel conditions and link rates.

Type Of Wireless Networks

Improvement of remote correspondences, like Bluetooth, IR, Wi-Fi, ZigBee, cell organizations, WiMAX (fixed), and Neighborhood Multipoint Appropriation Administration, arrived at a degree where a few choices are accessible. Many applications were enhanced by these various network types, whose coverage ranges from a few meters to thousands of kilometers. Several network properties that are frequently used in telemedicine applications are listed and summarized in Table I.

Table I. Properties of Some Common Wireless Systems

Network Type	**Frequency Range**	**Speed**	**Maximum Range**
Bluetooth	2.4–2.485 GHz	3 Mbps	300 m
IR	100–200 THz	16 Mbps	5 m
Wi-Fi	2.4–5 GHz	108 Mbps	100 m
ZigBee	900 MHz	256 Kbps	10 m
Cellular Networks	850–1900 MHz	20 Mbps	5 km
WiMAX (Fixed)	10–66 GHz	1 Gbps	10 km
LMDS	10–40 GHz	512 Mbps	5 km

Wireless home networks that make extensive use of IEEE 802.11 or Wi-Fi standards are affordable and suitable for Internet access. WLANs require more development to set up initial configurations before establishing communication links, compared to Bluetooth and IR. A/b/g/n are common IEEE 802.11 standards; The PHY specifications (PHY defining the transmission of raw data bits over air) and the MAC layer of WLANs (provides and addresses channel access control procedures to allow multiple devices to connect with a single AP) are taken into account in the definitions of these standards.

A single access point (AP) and mobile clients (MCs) make up a basic WLAN. Any mobile device that attempts to locate and maintain a wireless connection to networks via APs is considered a MC. To build the infrastructure for the wireless network, APs are positioned in various locations throughout the coverage area. The network's coverage area expands when more APs are installed. A wireless relay can help increase coverage's range. MCs are able to choose APs with a strong signal strength because there are multiple APs within close proximity.

The Wireless Ethernet Compatibility Alliance's Wi-Fi is a unified standard for a variety of wireless devices, derived from IEEE 802.11 WLAN. Wireless Internet is also used to refer to Wi-Fi from time to time. Wireless devices are referred to as "hotspots" or "APs." Because current home networks can be utilized with minimal modifications, Wi-Fi technology is frequently utilized in off-site monitoring of patients recuperating at home[8].

Hospital Network Topology

The computer and technology industries generally accepted open concepts at the end of the 20th century. As a result, a number of healthcare-focused technologies, such as roentgenography computerization, computed tomography, sonography scanning, and X-ray communications tools, were implemented and new interoperable platforms were created. In a similar vein, the number of centralized computer systems is going down, and tools like electronic medical charts started working with standard software like Windows and UNIX. At the moment, the healthcare devices listed above are able to connect to a single network system and exchange data across any platform. Figure 3 shows an example of a clinic network associated with all clinical gear inside an emergency clinic. Computers that are operated by the administrator, nurses, doctors, and other healthcare personnel are also connected to hospital networks[13]. To select a healthcare network, several criteria must be met: network bandwidth and service quality, redundancy, and system failure prevention measures; network infrastructure's flexibility, efficiency, and security.

WLAN In Hospital

Most hospitals have rooms for patients. Utilization of WLAN innovation increments as the general population use PCs and different gadgets. WLAN service is currently being used to provide inpatients with Internet access as a hospital amenity. When creating an open LAN environment, sufficient security measures must be taken into consideration[14]. Figure 4 shows an illustration of execution of WLAN in a medical clinic organization.

Hospital Networking

With the current wireless technology, healthcare professionals can connect to hospitals' information systems to access patient records from any location. However, the use strategies and technologies of the General Packet Radio Service (GPRS) in health care are generally required by a number of restrictions on current technologies. The following are the issues:

1. Insufficient flexible link between various mobile communication options and criteria for healthcare facilities.

2. Expensive links for communication.

3. Absence of additional information systems, such as integrated medical records and current e-health services.

Mobile health services have recently been reported to be using WLAN and Zigbee wireless technologies. Customers can use WLAN in data networks with speeds of up to 54 Mb/s as long as they are within covered range of a WLAN base station (typically 30–50 m indoors and 100–500 m outdoors). WLAN provides bandwidths with high data rates so that voice and multimedia communications can be carried out without risk of signal interference with medical equipment. WLAN enables medical staff to access medical information systems from a variety of locations and permits mobile communications within a medical facility.

The Zigbee standard is a brand-new, IEEE 802.15.4-based, short-range, low-power, low-rate wireless network that works in conjunction with high-data-rate technologies like WLAN and a variety of new applications. Zigbee guidelines can be used in different applications in clinical emergency clinic settings, for instance, patient body region organization and data trade among clinical gadgets.

Medical clinic region organization (HANs) are planned basically with WLAN and Zigbee. Because they use a low-power Zigbee network to monitor health sensor nodes, medical instruments, PCs at nurse stations, and convenient handheld devices, HANs have a heterogeneous network design. WLAN APs are used to connect the ZigBee medical network to other medical services. For intranet and Internet connections within hospitals or other centers for cooperative medical facilities, WLAN makes it possible to use a variety of intricate communication protocols, such as the Transmission Control Protocol and Internet Protocol. Improvement of a Zigbee-prepared bit incorporates a processor-radio board containing Texas Instruments MSP430 microcontroller connected to Chipcon CC2420 2.4 GHz handset over Simultaneous Fringe Point of interaction. Balun circuits connect the transceiver to the left 2.4 GHz Giga Ant Rufa antennas. Medical sensor nodes and devices use the proposed Zigbee ready mote as their hardware platform for the following reasons:

1.The possibility of achieving a battery life of one year.

2.The small size makes it easy to use.

3.Zigbee gives a security tool stash, which is established on Cutting edge Encryption Standard to guarantee dependable and secure organizations.

Image Compression

The problem of reducing the amount of information in a digital image's representation is addressed by using image compression. In order to produce a compact image representation and reduce the amount of space required for image storage during transmission, this method is proposed. Data that isn't needed is in each image. Images with duplicate data are referred to as redundant data; Pixels that are repeated across images or patterns could be this kind of data. By using redundant information in images, compression of images occurs. By reducing redundant data, images can be stored in less space. One or more of these redundant elements are reduced or eliminated as a result of image compression. Removing one or more of these fundamental data redundancies is necessary for compression. Three essential information redundancies can be distinguished or used in picture pressure (Between pixel Overt repetitiveness, Coding Overt repetitiveness, and Psycho-Visual Overt repetitiveness) which are:

1.**Redundancy Between Pixels:** Pixels in an adjacent image are not statistically self-determining because of the images' close correlation. Interpixel redundancy is the name given to this type of redundancy. Predicting a pixel value based on adjacent pixel values is one method for examining this particular redundancy, which is sometimes referred to as spatial redundancy. With such reason, planning novel 2-D exhibit pixels is accomplished through various organizations, for instance, different reaches between neighboring pixels. Reverse mapping becomes possible when the altered data set is used to reconstruct the original image's pixels.

(I). Redundance In Coding: Comprised of alterable length code, words are chosen in matching of measurements of unique sources. In such instances, the processed version is the image itself or its pixel value. This specific coding is continually reversible; Lookup tables are typically implemented and utilized. Examples of image coding schemes that investigate coding redundancy include the Huffman codes and the arithmetic coding technique.

(II). Mental And Visual Redundancy: The human eye does not respond to all incoming visual information with the same level of sensitivity, as various experiments on psychophysical aspects of human vision demonstrated; There are important parts of the information. The DCT-based algorithm at the heart of the JPEG encoding standard is one example of an image coding algorithm that takes advantage of this redundancy category.

Encoding the information in the original file is necessary when compressing an image using lossless compression. As a result, decompressed images are identical to the original in every way. Examples of lossless image compression include Graphics Interchange Format (GIF) and

Portable Network Graphics. The compressed images are needed to use a particular image compression format. The following schemes are examples of lossless image compression techniques:

• **Encoding For Run Length (RLE):** It is a straightforward type of image compression that runs stored data as a single value and count instead of as the original run. For sequential and recurring data, this scheme is used. RLE lossless image compression is achieved through the substitution of identical symbol (pixel) sequences known as runs by this method. RLE is ordinarily applied in fax machines.

• **Coding Entropy:** It is a self-sufficient individual; lossless data compression for specific medium characteristics. The creation and assignment of a unique prefix-free code for each unique symbol in an input is one main type of entropy-coding. When an entropy encoder compresses images, each fixed-length input symbol is replaced with a variable-length, prefix-free output codeword.

• **Encoding By Huffman:** An entropy-encoding algorithm used for lossless data compression, this was developed by Huffman. Huffman coding is currently frequently used as a "back-end" step in a number of compression processes. Reference tends to utilization of variable-length code tables to encode source images; The expected probability of the possible value of the source symbols is used as the basis for the derivation of the variable-length code table. Images' pixels are treated as symbols and frequently have a small number of bits assigned to them, whereas symbols that occur less frequently have a larger number of bits. Any binary symbol code with a prefix indicates that it is not the code for any other symbol.

The Lempel–Ziv–Welch (LZW) Model: It is a universal lossless data compression algorithm that was developed by Abraham Lempel, Jacob Ziv, and Terry Welch. LZW can be static or dynamic because it is based on a dictionary. During encoding and decoding, the dictionary in a static dictionary remains unchanged. During dynamic dictionary coding, this dictionary is updated. The algorithm is easy to put into practice, and it takes into account high-throughput hardware implementations. LZW is a popular UNIX file compression algorithm that can also be used to compress GIF images. LZW compression became the first widely used universal image compression technique for computers. A large English text file was once reduced to roughly half its original size using LZW.

As the name suggests, lossy compression results in some information loss. After several rounds of information compression, the compressed image is not the same as the original uncompressed image because reference to the image has been lost. Images work best with this strategy. A typical illustration of lossy compression is JPEG. Lossy technique is any algorithm that restores a presentation that is identical to the original image. An estimate of the original image is the basis for image reconstruction; Lossy compression methods necessitate measuring image quality as a consequence. When compared to lossless compression, lossy compression has a higher compression ratio. The following are the main performance considerations for lossy compression schemes:

1. Ratio of compression.
2. Signal to noise.
3. Speed of encoding and decoding.

The accompanying plans are instances of lossy picture pressure strategies:

1. Quantification On A Scale: Scalar quantization is a common type of quantization that uses the quantization function Q to map a scalar (one-dimensional) input value x to a scalar output value Y. Scalar quantization is as basic and natural as rounding high-precision numbers to an adjacent integer or multiple of several other precision units. It is typically identified as Y = Q (x).
2. Quantization By Vectors (VQ): It is a standard signal processing-based method of quantization; By disseminating sample vectors, it makes it possible to model probability density functions. VQ was first used to compress images. It works by grouping a large number of points (vectors) in groups with the same number of points next to them. The VQ density matching property has an impact on how large and high-dimensioned data can be identified. Low-error and rare high-error data are frequently observed due to the fact that the closest centroid index is used to represent data points. Because it is useful for data correction and density estimation, VQ is therefore suitable for lossy data compression[18].

The goal is to make transmission or storage more efficient or to save space when an image is reduced. However, the majority of compressed data algorithms are lossy, indicating that the original image's information is not preserved to allow for decompression-based recovery of the processed image. The altered image is not identical to the original before compression. However, with lossless compression, processed images can be restored to their original form without losing any details or clarity following compression. This condition demonstrates that no change ought to be distinguished when two pictures are thought about when pressure and decompression. A group of pixels with a long sequence of "0" and "1" characters makes up a digital image. Methods of lossless and lossy compression as described in the tutorial. Medical images can be transmitted more effectively over telemedicine networks and their cost of storage can be reduced by compressing them.

Packing happens by finding regions in pictures where tones are comparable; these regions are then set apart as "comparable varieties are recognized around here." Image redundancy, gaps, and empty fields are eliminated through compression. Lossy compression is inappropriate because compressed medical images typically contain a large number of sensitive and significant details. Compression makes it easy to lose these details, which are areas that cannot be the same shade of gray or color.

Details in a lot of medical images are represented by subtle colors and grey-shade differences. These details can be too fine to see with the naked eye, but they are important information about patients' health. These details include things like primary information about a cancerous tumor or an abnormal fetus. When necessary, compressed lossy image algorithms may discard weak details. The quality depth of image degradation is referred to as the quality factor. The following are a few works that are related:

By presented an algorithm that improves speed for multispectral images. This algorithm has a lot of redundancy in the search, which slows down the encoding process and saves space and time. The authors presented a quick algorithm search that scans the wavelet coefficient matrix when determining the significance of all required D(i, j) and L(i, j) during SPIHT execution in order to address speed issues. Another algorithm, block-based pass-parallel SPIHT, simultaneously encodes bits in a bit-plane of a 44 block while disintegrating wavelet-transformed images.[19] suggested five ways to improve compressed image quality. In order to preserve wavelet coefficients, a brand-new tree with a virtual root was first implemented. Second, speed, significance, and tree decision were all improved by employing an additional matrix. Third, flattened coefficients were processed prior to SPIHT encoding. Fourth, unsurprising pieces were killed from encoder yield by rearranging the coding system. Statistics serve as the foundation for the balance of quantization at the middle point. Using normal enhancement at 0.2–1 bpp, which reaches 0.5 dB for standard test images, these developments intensify peak signal-to-noise ratio

(PSNR) at very low rates, as demonstrated by experiments. Additionally, computation complexity is reduced.

A novel method for enhancing the robust transmission of a SPIHT-based color image coder over noisy channels was suggested by another study. When SPIHT bit streams are reorganized based on their represented spatial domains (square blocks), this scheme can be used without sacrificing coding efficiency. Independently, slices or groups of blocks are transferred. As hardware that is quick and easy to use, a new version of SPIHT was released.

In place of lists, a state table with four bits per coefficient was used to keep track of a set of partitions and encoded data. The ON-Line System (NLS) marks only a few descending nodes of unimportant trees, allowing for the natural identification of vast clusters of predictable unimportant pixels and their avoidance during coding. Putting away of picture information in one-layered recursive crisscross cluster decides the effectiveness of basic calculations. SPIHT and NLS perform similarly. The original SPIHT was introduced with a number of drawbacks; As a result, numerous improvements were made to this method. The SPIHT method, which is entirely a rooted coder-decoder (codec), may offer advantages, such as improved image quality, high PSNR, optimization for advanced transmitted images combined effectively to provide error protection, information sorting when required, and a reduced need for extensive error correction throughout the entire process.

Another advantage of SPIHT is that it only downloads small portions of the file, resulting in a compact output bit stream with significant bit variation and no need for additional entropy coding. SPIHT can speed up image transmission. However, depending on the location, the emergence of single-bit errors may result in significantly distorted images. A bit's leak of organization property can cause the decoder to misinterpret the message. This situation makes it difficult to perform operations on dependent compressed data, which significantly alters values, and indirectly traces the position of important figures.[20] suggested a novel bit-rate-reduced method for quickly transmitting and storing remote diagnoses in less memory. This work embraced a 8 × 8 DCT way to deal with execute sub-band disintegration. After that, entropy coding and data organization made use of the altered SPIHT. A straightforward transformation decomposes the initial signals into numerous frequency domains, which the wavelet-based algorithm can further compress to obtain DCT spectrum data in a single frequency domain. Using a suggested combined function associated with modified SPIHT, this scheme used corresponding insignificant DCT coefficients to specific spatial locations in high-frequency sub-bands to reduce redundancy.

The simulation results showed that embedded DCT-SPIHT image compression improved PSNR-based reconstructed medical image quality and reduced computational complexity to only a quarter of that of wavelet-based sub-band decomposition; over JPEG2000 with the original SPIHT, results remained constant at comparable bit rates. The suggested DCT-SPIHT can be implemented in high-speed image coding and transmission because commercially available implementation of 8 x 8 fast DCT hardware is available.

Due to its simplicity, JPEG compression is a widely used method of image compression that has become a global standard. JPEG was created in 1992 with the intention of compressing real-world color or natural grayscale images. In many image processing applications, the sole mode and the baseline sequential DCT-based operation mode of the JPEG standard are extensively implemented. The updated JPEG2000 standard was developed in response to the widespread use of digital imaging equipment and the pressing need for high-performance image compression techniques that can offer more complex functionality than the JPEG standard. Numerous novel features are provided using the discrete wavelet transformation (DWT) and arithmetic entropy coding; These features include the ability to extract portions of an image for editing without decoding them and to concentrate on specific areas of interest with clear visual quality and a specific bitrate. The foundation of the JPEG2000 compression standard is DWT and arithmetic entropy coding.

When the independent sources (elements of S) have heavy-tailed distributions and the columns of A, which can be seen as a (possibly overcomplete) basis, are wavelet-like filters, it has been discovered through the application of ICA that natural scene images are well modelled. This indicates that only a small number of S's components are likely to have significant values; When the problem of finding effective image codes for natural scenes is addressed, this sparse nature of S provides the foundation for the possibility that overcomplete ICA could be utilized for the compression and denoising of natural images. When compared to the complete representation, the overcomplete representation provides a more accurate representation of the data's underlying statistical distribution.

The use of independent component analysis (ICA) for image compression is discussed by the authors in[22]. Their objective is to investigate the ICA-learned bases' suitability for lossy transform compression. They come to the conclusion that ICA is a great resource for learning to code for a particular image class, and that this can even be done with just one image from that class. This is an alternative to customizing a coder for a specific class by hand, as was done with the WSQ for fingerprint images, for example. Another conclusion is that a natural image-based coder behaves like a universal coder, which means that it is very good at generalizing to a wide range of image classes.[23] introduced an ICAMM algorithm that uses decomposition as the foundation for low-bit, high-speed image compression on image sub-blocks. The wavelet basis functions are approximated by the over complete independent component effect. The independent component is relevant to the data itself, which sets this apart from the discrete cosine function and wavelet function. Self-adaptive learning can be divided into several subgroups based on the various characteristics of the text images when the over complete independent component analysis is used to decompose the image subblocks. There is a set of over-completely independent components for each subgroup. Using less bit rate can be more efficient in this way. In addition, the subgroup's information can be utilized for image transmission thanks to the various encodings. The results of the experiments demonstrate that the method we propose compresses images at a low bit rate.

Conclusion

Medical data compression and transmission strategies for WLAN-based telemedicine systems are the subject of this paper. In recent years, a lot of research has been done on these methods. However, the researchers used WLAN methods to address a number of issues with the existing healthcare and hospital network schemes in order to enhance the performance of medical data transceivers. To meet accepted research objectives, approaches to data compression should be further investigated as essential tools for reducing communication bandwidth and conserving transmission power.

References

[1].B. Fong, A.C.M. Fong, C.K. Li, and A.C.M. Fong, Telemedicine technologies: Telemedicine and information technologies in medicine 2011: Wiley and Sons

[2].M.A. Algaet et al., The use of telemedicine in management of telemedicine.

[3]. Algaet, M.A., et al., 2014, Outskirts Press, Inc. supplying e-health services with high-quality wireless telemedicine services. in the 2013 IEEE Conference on Information and Communication Technologies (ICT). 2013. IEEE.

[4].M.A. Algaet et al., Providing e-health services with high-quality wireless telemedicine services: a summary. 2014: Personal Wireless Communications 78(1): p. 375-406.
[5].Ahamed, S.V., Keen organizations: recent methods and their use in medical systems 2013: Elsevier.
[6].Applied Signal Processing by N. Hamdy: Systems, circuits, and concepts. 2008: Press CRC.
[7].E. Perahia and R. Stacey, "Next-generation wireless LANs: n 802.11 and ac 802.11 2013: Press of Cambridge University.
[8].R.S. Chowdhury and S. Banerji, IEEE 802.11: Technology for a wireless LAN. 2013: arXiv preprint arXiv:1307.2661
[9].Delgrossi, L. and D. Jiang. IEEE 802.11 p: toward establishing a global standard for wireless vehicle access. in the 2008 Vehicle Technology Conference Spring 2008 VTC IEEE. 2008. IEEE.
[10].Digital Front-End in Wireless Communications and Broadcasting: [10] Luo, F.-L. processing of signals and circuits. 2011: Press of Cambridge University.
[11].Y. Nijsure et al. Spectrum and power allocation in radar networks for joint cognitive communication that are location aware in the 2011 Sixth International ICST Conference on Cognitive Radio Oriented Wireless Networks and Communications (CROWNCOM) 2011. IEEE.
[12].Forward error correction for 100 G transport networks by F. Chang, K. Onohara, and T. Mizuochi. 2010, IEEE Communications Magazine 48(3).
[13].Pharmaceutical knowledge management: problems, advancements, and triumphs 2010: Science & Business Media, Springer.
[14].Algaet, M.A., et al., Improvement of Wi-Fi IEEE 802.11 b-based robust medical image transmission in the hospital area. 2017, Personal Wireless Communications 95(2): p. 1617-1634.
[15].Sen, S., and others improving in-building WiFi localization by avoiding multipath. in Continuing of the eleventh yearly global meeting on Portable frameworks, applications, and administrations. 2013. ACM.
[16].C.P. Jayapandian et al. Cloudwave: utilizing Hadoop, distributed processing of "Big Data" derived from electrophysiological recordings for clinical research on epilepsy. in AMIA Yearly Discussion Procedures. 2013. Association of American Medical Informatics.

[17].Paul, R.P., C.K. Modi, and R.K. Kher, A novel and straightforward algorithm for compressing medical images. 2012 edition of the International Journal of Biomedical Engineering and Technology. 10(4): p. 333-350.
[18].Vector quantization and signal compression, by A. Gersho and R.M. Gray. Vol. 159. 2012: Science & Business Media, Springer.
[19].Ghanbari, M. and E. Khan. Transmission error detection and correction for SPIHT-coded images. in processing images. 2002. Proceedings. International Conference on in 2002 2002. IEEE.
[20].G. Kumar et al., A Summary: Arithmetic-Huffman Coding-Based Image Compression and the DWT-DCT Technique In 2015, IJ Engineering and Manufacturing 3: p. 20-33.
[21].Alves, A. Puga, and A. Alves An experiment comparing PCA and ICA when coding images using classical transforms. in ICA. 1998.
[22].On the application of independent component analysis to image compression, by A.J. Ferreira and M.A. Figueiredo. Processing of Signals: 2006, Image Communication 21(5): p. 378-389.
[23].C.-C. Peng, C.-H. Kao, S.-P. Hsieh, and C.-H. Utilizing over-complete ICAMM, quick image compression. at the 2010 International Conference on Control Automation and Systems (ICCAS). 2010. IEEE.
[24].A. Mustapha, et al., [24] Towards nonuniform light face upgrade by means of versatile difference extending. Tools and Applications for Multimedia, 2017. 76(21): p. 21961-21999.
[25].L. Hadzievski and colleagues, a novel mobile transtelephonic system with a 12-lead ECG that has been synthesized. 2004 IEEE publications on information technology in biomedicine. 8(4): p. 428-438.

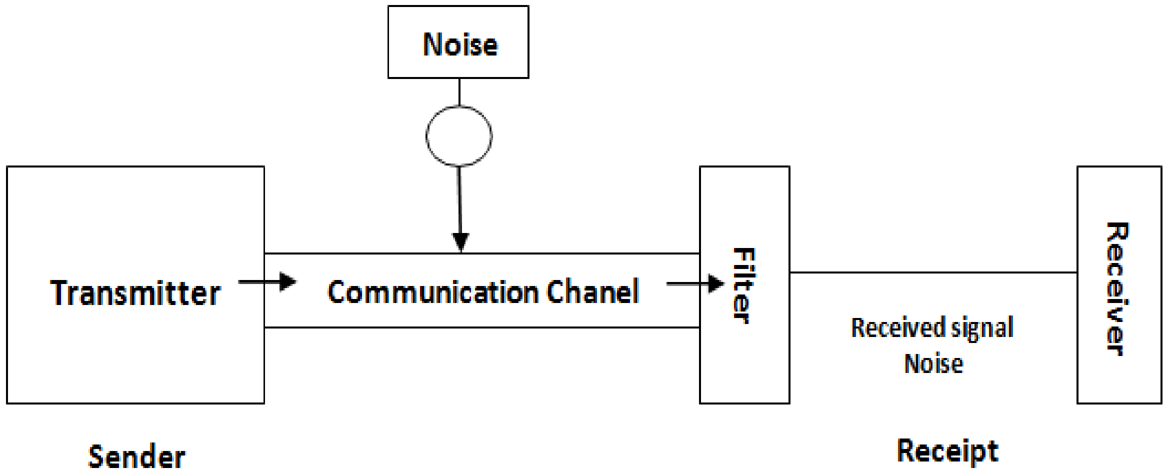

Fig. 1 Communication System Under Noise Presence

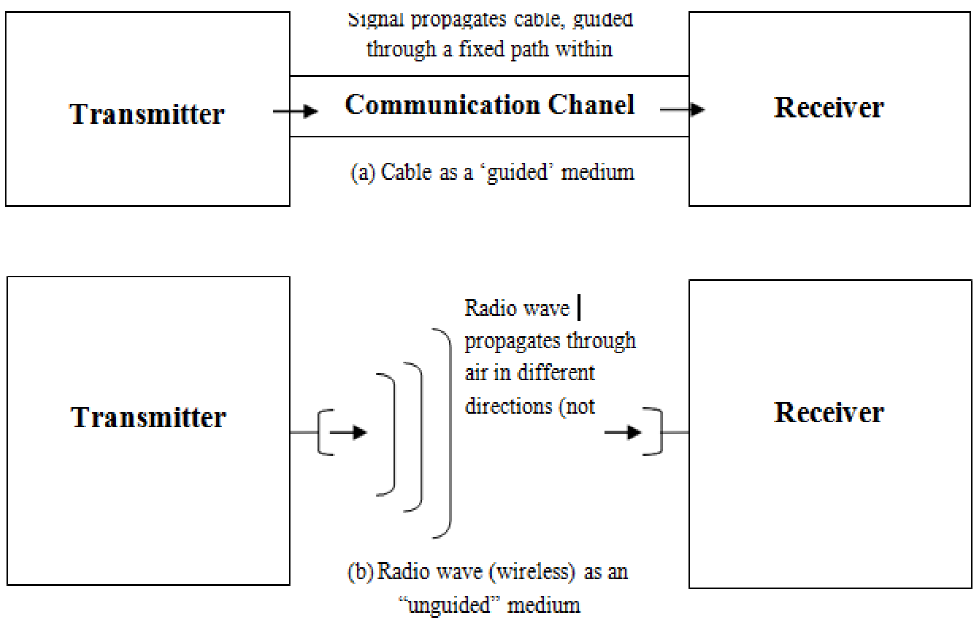

Fig. 2 Guided Versus Unguided Transmission Medium

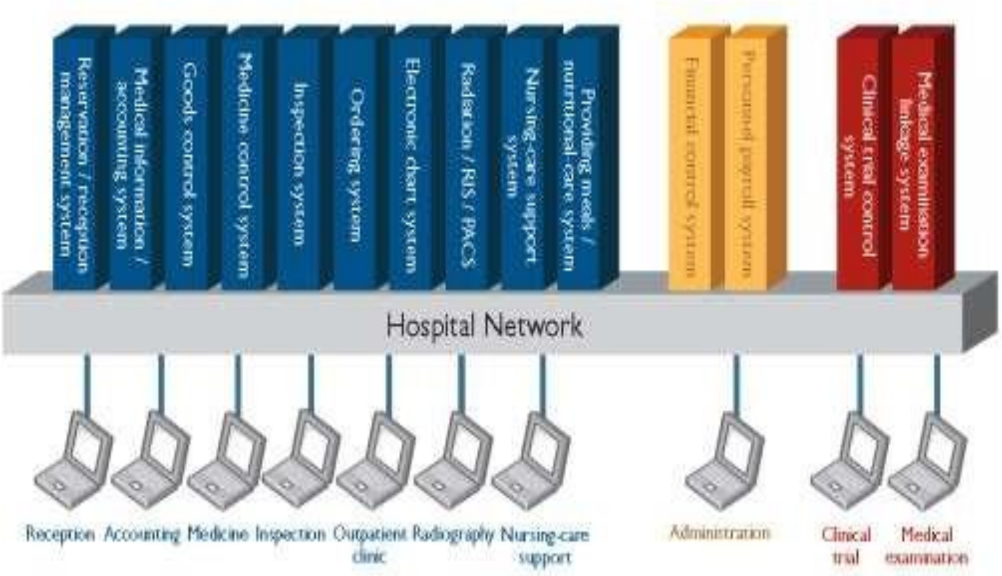

Fig. 3 Hospital Network Connecting All Infrastructure Including Medical Apparatus, Administration And Clinical Doctors [13]

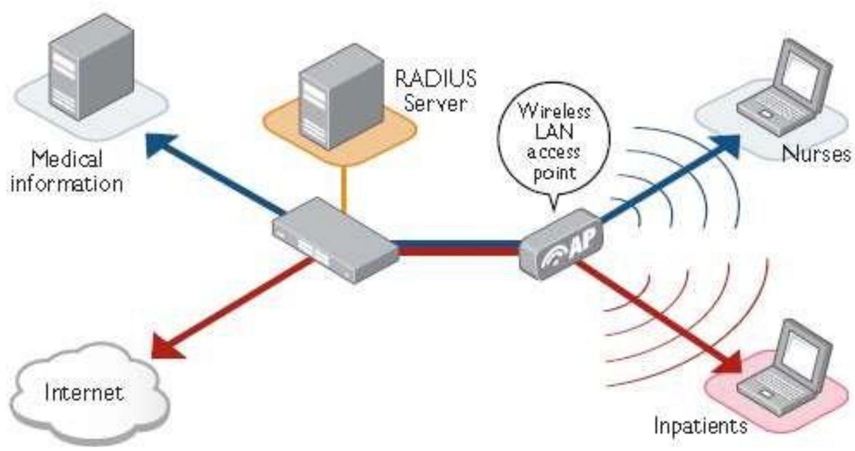

Fig. 4 Example of WLAN implementing in hospital network that facilitating either healthcare staff or inpatients[15]